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THESIS IN ARCHITECTURE

GREAT FALLS VOCATIONAL-TECHNICAL CENTER

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GREAT FALLS VO-TECH CENTER

Great Falls, as many other Montana cities, has adopted the idea of making available Vocational Technical centers for people wishing additional schooling without going to college.

Great Falls placed this facility in an old schoolhouse as most other Vo-Tech centers are placed in the state of Montana.

I would like to design a new Vo-Tech center for Great Falls, for the faculty, and the students of the center, in hopes that it will initiate people that might be considering an education of this type to go there for an education. I am proposing a solution to this problem by using it as my thesis study in this,, my fifth year of architecture.

Most of the Vo-Tech centers in the state are seemingly after-thoughts and are housed in facilities that don't really meet the needs of the school. I would like to design the school so it meets these needs in full. In order to learn what the needs of the people are, I will consult people involved with the Vo-Tech center in Great Falls. I believe that these people will be the best at programming their own needs.

I would also like to consult any other interested people in the Great Falls area or the whole state, for that matter, that will be interested in a facility of this type in Great Falls. There are several other types of educational facilities in Great Falls that could be included in the Vo-Tech facility. These facilities could include the Commercial College and the Auto College. These are both expanding vocational educational type colleges apart from the Vo-Tech center in Great Falls and they plus others might desire that their facilities be combined with that of the Vo-Tech center.

I would like to learn the social and physical needs of the people involved with the school and hope to learn just what should be done to initiate people to programs of the Vo-Tech center. I believe that an important factor to initiate people to a type of education is the facilities available to them and how these facilities are housed.

The final presentation will be in model, drawings, and slides with the addition of new and old techniques that I believe will make a better understanding of the project.

My advisor will be Prof. Leavengood and I would like to utilize any other faculty member that I can consult in their particular field, such as Prof. McClure in structures, Prof. Eck in electrical and mechanical, and Prof. Wessel in planning, also, Prof. Pierce as a design resource person; with Professors Leavengood and Pierce as my design consultants, I feel that I can get a complete and unbiased critic on my Vo-Tech center. The reason for this being that I have never had either of them for a studio or class in the past. Therefore, they don't know me and my work and I don't know them and their desires. I feel this can only repeat what is known in many client-architect relationships in the early career of an architect and this will increase my experience not only in design, but in client-architect relationships that I will need in my career as an architect.

Darrell A. Swanson

Thesis Proposal

VOCATIONAL EDUCATION
GENERAL & HISTORICAL BACKGROUND
CONCEPTS & PROCEDURES

Compiled by
DARRELL A. SWANSON

GENERAL & HISTORICAL BACKGROUND OF VOCATIONAL EDUCATION

Vocational education made very early beginnings among the races of mankind. In all of man's efforts to conquer his physical environment manual skill and knowledge pertinent to specific tasks have in one way or another been transmitted from man to man and from generation to generation.

The store of knowledge held by man was increased each time a new discovery was made. Even the smallest amount made it necessary to disseminate that knowledge and put it to use. This was done by developing skills among recruits to the arts.

In a primitive and static society there was no wealth of usable knowledge upon which to draw when man contemplated better ways of doing things and means of easing burdens. Discoveries were rare and invention so slow that man could only inch his way toward a better and safer existence. But even in this groping forward, the usual or customary occupations and work processes had somehow to be taught to the succeeding generations. Most of the skill and knowledge handed down from one generation to the next had been traditional among the races for centuries.

It is probable that all the phenomena of vocational training existing in modern society have their roots in the past. In a sense, we are not dealing with a new thing, but with extensions and developments of a system of training that has been in existence since the beginning of mankind.

Young people have been looked upon as an invaluable asset to the social unit, whether that unit comprised the family or the state. This idea stems from the concern of man for his security. No doubt, the first objective of vocational training was to develop skill in using weapons. With weapons man obtained food for himself and his family; with weapons he confronted his enemies. Group safety being vital, this kind of training was possibly the first to take conscious and organized form. Training in the use of weapons is probably one of the oldest activities of the teaching profession.

Next in importance from the standpoints of social survival and progress was the gaining of an appreciation of youth as a resource of the future, a labor asset; the recognition of the need to give what may be rightly called vocational education to social recruits.

Vocational training in its early aspects seems to have adopted one or the other of two procedures, the training of youth being accomplished either as a natural outcome of family living or by studious observance of the art and practices of adult members of the social group. Imitation was the process through which youth learned the latter. Overall, the training a youth received in

productive tasks of adult members of the social group was through imitation. These tasks included the tilling of the soil and caring for domestic animals; this being secured from the male members of the family. For skill in the use of weapons, the youth coming into manhood had the benefit of instruction from huntsmen and warriors, the valiant members of the tribe performing this duty in way of custom.

In the primitive stage of human endeavor there was little time for relaxation, only unremitting hard work, and most tasks were work tasks. Then, as always, certain members of the group showed singular ability in the performance of this or that task. Occasionally, whether by diligence or chance, someone would discover a new and more efficient way of doing a certain thing, or perhaps make a startling discovery. In either case, it was the custom to assign young members of the group to those skilled in the arts practiced by the elders such as hunting, fishing, and fighting, or the practices employed in yielding products from the soil, that these recruits to all the skills might themselves acquire skill upon which man's security was based. This education of youth in earliest times and among all peoples formed the basis of the "helper" system of modern employment.

Modern society still has all of the forms of vocational education described thus far. Farm boys still learn farming from their fathers. At the same time, agricultural schools and colleges are moving froward in the systematic teaching of agriculture to growing numbers. Girls still learn the duties of housekeeping from their mothers, and organized instruction in home economics has become increasingly important in the curricula of modern schools. In fact these fields of learning are no longer restrictive in sexes, they are offered to men and women alike.

The pickup methods are common by workers in widely diversified fields today. Observation, imitation, and individual initiative constitute the sole means of training. However, there is a demand for organized training which is being sought after and offered by employers, by schools, by skilled craftsmen, and by all agencies concerned with industrial improvements.

The generally accepted principle that only a person who is himself competent in a craft can give effective vocational instruction in that craft asserts the value of the specialist in transmitting skill and knowledge. Every discovery of the world of science and every invention finds its use through instruction given to others by its discoverer. Only in this way does any discovery add to the sum of human knowledge and achievement.

The development of our civilization has made us aware of the need to increase the educational area covered by conscious and more or less organized instruction to the fullest possible extent. Such has long been the case in academic education and it should be likewise in vocational education. In general, the whole problem of education, in civilized society as compared with the static society of primitive peoples, is that of involving factors of individual initiative and ingenuity; unconscious absorption and imitation; conscious imitation in the home; unorganized training in the home; organized training in the home ; division between home and occupation; conscious and organized training through

apprenticeship; pickup learning of specialized tasks; and organized training through such devices as apprenticeship, the foremen instructor, and the public and private vocational school.

More rapid and more effective training of larger numbers of people has been brought about by the tremendous expansion of production caused by the substitution of the power-driven machine for the old handcrafts; which in turn has resulted in keener competition of modern business. The ineffectiveness and inadequacy of the pickup method of training new workers have become gradually apparent. The contributions of science and invention have not only made this tremendous production possible but have called increasingly for systematic training of technicians and leaders. The progress of science and invention has resulted in an increased demand for the technician and inventor and, at the same time, has created great numbers of new jobs and profoundly modified the processes of many old jobs.

The content of an industrial occupation easiest to secure by pickup and practice is manipulative skill. A demand for technical knowledge (the why of the how) has come into being over the purely manipulative skill, and the ability to apply that knowledge intelligently. This shift has brought about the necessity to equip the learner with understanding and resourcefulness through some form of organized training. The realization of this has led to a renewed interest in vocational education to make it more systematic and therefore more efficient .

The revival of apprenticeship, the attempt to restore the foreman to his ancient place as instructor of his men; and the establishment of correspondence, privately endowed, and corporation schools have been established as vocational schools because of increased interest in obtaining this efficient and beneficial training.

Social wealth furnishes the opportunity for society to maintain stability and progress. The greater the degree to which social wealth can be produced efficiently, the greater the potential resources with which to achieve our aims as a nation.

Organized vocational education is an efficiency service. It undertakes to do nothing that has not been done before. It strives to discharge the function more efficiently. The trend toward more systematic training is nothing more than the crude realization that vocational education can be regarded as one of the agencies whereby the state can more efficiently secure social wealth. Social progress will be furthered, greater social wealth will be produced at less cost, society will be better equipped to carry on its struggle against destructive forces in nature, and to realize its hopes and aims, as we are able to substitute organized vocational education for unorganized vocational education.

Education, not force, must be relied upon to secure stability and progress in a democracy. All education contributes to the conservation of natural and human resources through which comes our production of wealth that in turn maintains this country's stability and progress. Education must be adapted to a wide diversity of human needs and human problems. Many forms can be taken to achieve this end. Vocational education is considered a special

form of education in its relation to the development of the material and human assets of a people.

There are two ways in which vocational education functions in any forward looking program of a democracy. First, it conserves natural resources. Second, it conserves human resources. It conserves material resources by promoting, disseminating, and transmitting skill, knowledge, and the results of invention, and by conserving human effort, but by promoting morale and intelligence.

Wealth is created by making the most of natural resources whether these be native to a country or imported. A country having no means of importing natural resources, or no need to import them, might be called self-contained.

The total wealth produced would depend upon the value of the products created from natural resources, in terms of consumer demand, in a self-contained country. The value of such products depends upon the amount of skill applied in turning them out. It also depends upon the efficiency of the operations and processes by which production is accomplished.

In a self-contained country natural resources would be fixed. The amount of skill and technical knowledge used in creating products would be limited only by the possibilities of human invention and the extent to which skill could be developed and utilized. No bounds can be set upon inventive possibilities, nor upon the discoveries of science. The same is true of the application of technical knowledge, as well as the limits of human skill. A self-contained country would gain in wealth in proportion as these factors were developed and applied.

Realistically, there is no country that is self-contained. The development of cheap methods of transportation has made it possible for any region to draw upon the natural resources of any other region. The fact that any state or any nation is in competition with countries more favored in possession of this or that natural resource that itself, makes necessary the development of higher skills and greater technical knowledge to offset the advantage held by countries more favorably endowed. This fact was one of the important points considered by the Douglas Commission on Industrial Education for the state of Massachusetts. The commission's report was the chief instrument in securing a strong vocational program for that state.

If the wealth of any country depends upon what it is able to do with native or imported raw material, and if progress and stability depend upon the extent to which wealth is produced, then any country is vitally concerned with the means by which skill is developed, technical knowledge obtained and applied, and science and invention promoted.

The development of science and invention is the basis on which the character of skill is determined and technical knowledge secured. In this respect a democracy has a decided advantage over countries having a form of government tending to be repressive. Democracy offers the freedom of initiative that spurs the effort of scientists and inventors.

Hand in hand with the promotion of scientific discovery and invention as a means of producing wealth from natural resources is

the efficiency with which these resources are converted into marketable products. The struggle to achieve maximum utilization of natural resources, a never ending struggle, passes through three stages. A discovery is made in the field of science. A new machine or mechnical appliance is invented. The problem then becomes one of working out processes and of developing the machine so that it will produce with the highest efficiency and with a minimum expenditure of time, energy, and money. During this second stage, as the machine is improved or the process involved is more fully worked out, there is need for development of the skill required to operate the machine or control the process.

An accurate estimate of the technical knowledge required for control of the process or for the operation of the machine is needed by those who have full knowledge of the process and the machine. This knowledge constitutes the content of the particular production job.

Continuous development is necessary to progress. If we stop with the discovery itself or with the invention, either it suffers neglect or we fail far short of securing from it all the benefit to be had. If we fail to determine the kind and degree of skill needed to operate a new machine or carry on a new procedure as each is developed, we fail to get the greatest good from the product of our creative skill. If we fail at all stages in the development of a machine or a process to determine the nature of the knowledge required for successful operation and control of that machine or that process, then we fail to realize the ultimate in benefits to be derived.

The necessity for rapid adaptation of the worker to the job, and for the continuous readaptation as new machines and high-production methods are introduced, finds the pickup method, even for the unskilled, woefully inadequate to the situation. Large-scale production makes the efficiency of the worker a matter of far greater concern today than in the past. It is increasingly necessary that the old method of breaking in a new worker be surplanted by well-organized and more systematic wasy of conferring both knowledge and skill.

The tendency has been to relate this totally to industrial activities while ignoring the supposedly less essential fields of agriculture, commercial, and homemaking. The substitution of systematic for makeshift vocational training procedures is therefore evidenced almost exclusively by the universities and engineering schools. Without intending to discount the accomplishments of training below college grade for industry, agriculture, commerce, and the home, it must be admitted that the showing here is far less impressive than in the field of professional education.

In the professional field the pickup method of training has been practically abolished, but for the great mass of workers it continues in force. This difference cannot be accounted for altogether by the fact that in such professions as law and medicine and teaching legal standards have been set up which individuals are compelled to meet in order to be admitted to practice. Rather, the difference is due chiefly to the fact that the professions have traditionally been held to be dignified and important enough to merit every assistance. On the other hand, productive work,

whether in agriculture or industry, has been held in lower esteem. Recent efforts to correct this situation have been made.

License requirements have been established for plumbers, electricians, and steam engineers which is significant when noticing the fact that this promotes organized training. The dangers involved in these fields which affect the public health and safety prompted these requirements.

The setting up of license restrictions was followed by programs of organized training planned to fit the job applicant effectively. In a reasonable length of time programs were set up to meet requirements of the state examining board, and therefore of the job. Certification of tradesmen, however, was not established for the purpose of promoting the trades or to control the training of workers, but solely as a measure in the public interest.

The old apprenticeship plan was well suited to the conditions of a simple society in which knowledge and skill were handed down from one generation to another. It failed to meet the conditions of modern society. The problem became one of disseminating as widely and as rapidly as possible the knowledge and skill that keep step with discovery and invention.

The constantly growing body of information and the resulting shift in tools and techniques taking place in industry, create a very great demand for trained workers in widely diversified fields. Means of rapid communication make it possible to spread needed knowledge effectively. It requires organized vocational education to insure that assistance shall be given in a systematic way whenever and wherever it is needed.

Thinking not of the engineering or agricultural college as a vocational school, we lack the realization of the extent to which leadership in production is represented by men who have come up through the ranks of journeymanship to positions of responsibility. These men without engineering education and withou organized occupational training gained, by intelligence and earnest application, a mastery of the processes of control operating within their special occupational spheres. They gained, as well, the ability to organize and direct. The training of these men was meager, unscientific, and wasteful of time and effort, but they worked to the top nevertheless.

As systematic vocational education is developed in this country through a wide variety of day, part-time, and evening classes for apprentices and journeymen, so will the industrial leaders of America be wisely selected and well equipped to meet the growth demands and responsibilities of their callings. Nothing else will so promote economic efficiency in America.

When the American technical high school, common to our larger cities, finds its best field of usefulness, it will not be as a school preparing young people for the engineering college. The technical high school will serve as a finishing school preparing young people for careers leading to positions of authority on the directive side of industry.

No other country in the entire world has been so prolific in discovering and inventing ways to increase production and reduce costs as the United States. Applied to our rich natural resources, these discoveries and inventions will continue to be the chief

factor in the creation of our social wealth, with its attendant opportunities for social progress.

The inventor is also a man who has gained skill by practical experience and understanding of mechnical processes commonly employed. However, he lacks, at the beginning of the task undertaken, the special skills and the special technical knowledge necessary to the solution of his difficulties. As a result, he muddles his way through by a process of trial and error. He acquires through his mistakes a grasp of the technical principles and mechnical laws applicable to his problem. He may need to consult with others for the specific information necessary to make his device work successfully. Generally, all of these conditions enter into the situation.

This haphazard method of learning to invent is socially wasteful even in the case of an inventor who is finally successful. He often spends years in misdirected and futile effort before he makes one contribution. If he had been properly equipped with the functioning facts bearing on his problem, the periods of blundering experimentation would have been greatly reduced. The time saved could have been applied to the production of other inventions or to the discovery of other practical processes.

This all boils down to the fact that Vocational education and inventing go together. Think of the possibilities if successful schools for the training of inventors at public expense were to be established. The enterprise would probably be the wisest social investment that could be made, regardless of cost. There is no such thing as direct training for the occupation of inventing; like poets, inventors are born, and not made. They possess certain native aptitudes that create successfully in proportion to the experience of resourceful thinking in respect to devices and processes. So this aptitude has been equipped in some way with the thinking stuff, the experiences, the skill, and the pertinent information which are needed to solve problems.

As organized vocational education comes to take the place of the old pickup method of the past, this thinking stuff will be so diffused that every person having inventive abilities will have the opportunity to get the help he now so badly needs. This will be sure to result in uncovering and selecting, stimulating and equipping better invention. It will lead to the creation of better devices and processes for the conservation of human effort in the production of social wealth.

The recognition of wasteful and haphazard processes of invention in order to keep pace with modern needs and developments, has brought about the establishment of research divisions in many of our large industries. Hundreds of carefully selected employees with special backgrounds of training and experience devote full time and effort to research and organized invention. The methods employed in research laboratories associated with large and small industries have greatly accelerated the improvement of existing products. They have brought to light innumerable new processes and useful commodities which are advantageous to industry and important to the progress and standard of living of our country.

Coupled with the research divisions supported by industry, many of our universities and land-grant colleges are carrying on

similar research programs at public expense by means of contributions by private donors or by endowments. These programs in industry and in colleges will do much to maintain the position the United States has attained in serving its own citizens and the people of the world. The fact remains that, in spite of these organized efforts in research and invention, many of the ideas which are carried to final development originate in the minds of workmen and other individuals possessing inventive ability. If knowledge of the basic sciences underlying most of our progress could be provided the workers in industry, the improvements and developments in many fields would be astonishing.

In America we have traditionally believed that opportunities for success in a chosen field of work are limited only by one's own capabilities. Supposedly everyone is endowed with inherent rights to choose a career and prepare for it to the best of his ability. The public schools of this country have been looked upon as the foundation of this ideal. Today, however, the school stands squarely between an individual and the job to which he aspires. Technological change and increased demands for skills of a high order call for corresponding increases in the quantity and quality of vocational and technical training.

In this age of change in practically all areas of living, expectations from vocational-technical education have taken on new proportions. Educational leaders in this country recognize what might well be considered a renaissance and expansion of technical and vocational courses and programs to provide needed educational experiences related to the world of work. Leaders in the field believe that vocational education has again become a respected member of the educational family. The increased recognition of the importance of education in reaching national goals and the demands being made upon the schools to prepare young people for their places in a rapidly changing world of work will also bring new interest, new life, and new emphasis to vocational-technical education.

The need for this trained manpower has been brought to light over the years through study and obvious facts such as production reports and unemployment charts. There are of course, many factors influencing the heightened concern for more effective vocational programs and facilities. The high school has generally been considered responsible for providing programs to help prepare students for futher education, job responsibility, the armed services, and home and family life. It has been estimated that this nation spends 80 percent of its education dollar on about 20 percent of its students. The college-bound academic student receives the greatest share, of course. Today only 6 of 10 students who enter elementary school graduate from high school, and approximately 8 of 10 now in school will not complete a four-year college program. Educational programs must be provided for these students. Generally speaking, this need is not being met as weel as it should be.

Training for skilled work seems to have been neglected or taken for granted in many instances. The program of vocational and technical education must be expanded and improved to meet the needs of new workers.

> Regardless of his race, intelligence, or place of birth, the human being is the greatest resource any nation can possess. Maximum development of human resources must become a major national objective. The large numbers of youth in schools and colleges represent an opportunity to invest in the only resource which can in the long run bring the promise of a productive and useful life to everyone. Each time this precious resource is wasted, to whatever degree, it represents a grave loss to the nation and the world.[1]

Occupations are being disrupted by technological change and new occupations are constantly appearing. This is an age of almost unlimited career opportunities for young people--an age of great challenge to the schools in preparing students for the world of work. Unfortunately, many able young people have not had the training opportunities and the job counseling needed to prepare them adequately for openings requiring highly specialized skills. Without greater efforts to develop better educational pragrams and train more workers, there will be a critical shortage of all kinds of technical workers. Laboratory assistants, electronic technicians, data-processing specialists, construction estimators, marketing specialists, technical secretaries, draftsmen, supervisors of production control, technical photographers, practical nurses, food service managers, and safety inspectors, to name a few, are already in short supply. There are indications that this decade will experience an annual shortage of nearly half a million skilled craftsmen, carpenters, bricklayers, plumbers, electricians, mechanics, lathe operators, and machinists; that the demand will grow for sales and office workers, typists, secretaries, stenographers, telephone operators, office clerks, and retail and wholesale sales personnel; and that there will be steady openings for service workers such as cooks, waitresses, barbers, policemen, firemen, and beauticians.

The United States, boundless in its material wealth, unmatched in its standard of living, and justly proud of its rich heritage, can ill afford to allow the great bulk of its children to reach young adulthood poorly prepared to maintain and extend the heritage for those who will follow. In transmitting his manpower report to the Congress in 1964, the late president, Lyndon Johnson, said:

> We must raise our sights--and strive to realize each person's highest productive and earning capability. We must seek to develop more completely our people's talents and to employ those talents fully--to fulfill the rich promise of technological advance and to enable all to share in its benefits.[2]

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[1]Venn, Grant. Man, Education, and Work. Washington, D.C.; American Council on Education, 1964, p. 157.

[2]Johnson, Lyndon Baines. Manpower Report of the President. Transmitted to the Congress March 1964. Washington, D.C.; Government Printing Office, 1964, p. xi.

Today vocational-technical education has a secure and important place in the domain of public education. There is less certainty about where it should be located in the sequential and institutional divisions of educational experiences. Now the argument is over the comprehensive high school versus the vocational-technical high school versus the community colleges. These conflicting opinions, often resulting from lack of information, understanding, and interest, are gradually fading, and broader understandings are emerging. There is a growing realization that all three types of educational institutions have their places in American education as it relates to vocational-technical training. As needs increase, educational programs designed for the vocational development of youth and adults will be strengthened and improved in both comprehensive and specialized vocational-technical training high schools throughout the nation and will be continued and expanded in good community colleges. Many people look for a trend toward the vocational-technical center, because small high schools cannot meet the needs of the times for specialized training and because certain types of training require highly specialized and expensive equipment which it is not practical to duplicate in other educational units.

Vocational-technical education must be an integral part of good planning for today's schools. At a time when the needs of society are so clearly identified; when the national interest in well-trained manpower is at an unparalleled level; and when expressions of need are being voiced loudly by business, industry, and citizens, there is no other choice. If local school systems fail to meet these needs and to develop programs and facilities with the capacity to train and retrain members of society in the continual development of the salable skills needed in the world of work, some other agency or force will step in to undertake the job. Our stakes are too high to risk the delay while we dispute such trivial arguments as those related to centralization of training versus comprehensive high schools, general education versus vocational education, specialized training, or cost versus investment in people. This job must be done now, and it must be done better than ever before.

The role of the high school has been changing. The pace of change accelerates and becomes more challenging with each passing day. A review of major national policy statements on education reveals that occupational preparation is now recognized as a major objective of the high school. There is growing concern because young people not preparing for futher education in college need specialized education to prepare them for employment. This has always been true from a relative point of view, but this decade's changes and the challenges of the decades to follow have sharpened the focus in this direction.

There is a definite challenge in this field because of the rapid pace changes are being made which in turnare brought about by the improvements in communications, production, and transportation. The educational lag has been reduced. Leaders in education can and must plan and project ahead from ten to twenty years with public acceptance and support. A school building or facility that is planned for today only is obsolete when ready for use three years hence. There was a time when courses of study were generally considered to

need revising every five years; now, some technical courses, such as those related to some phases of electronics, need revising every three months in industrial practice. The problem is further compounded by the fact that many communities are faced with the problems of very rapid growth. Small country stores are being replaced with massive shopping centers, large cities are overflowing into the suburbs, and industries are diversifying and decentralizing. These changes result in growing pains for all government agencies--especially for the public schools.

> "The primary reason this nation has not yet established a society in which there is equal opportunity to learn and work is that it has not yet tried," states the National Advisory Council on Vocational Education.[3]

In previous reports, the Council urged the nation to overcome its preoccupation with the college-bound and to get over the idea that vocational education is for someone else's children. And in language unusually firm for a government advisory committee, the Council called on the federal governement to reorganize the U.S. Office of Education, alter its manpower policies and legislation, and change the funding pattern by which it invests $14 in the nation's universities for every $1 it spends on vocational education programs, and $4 in remedial manpower programs for each $1 it invests in preventive vocational programs.

This accent on remedial, rather than preventive,programs, ignores several significant facts:

First, about 85% of the population, according to the U.S. Office of Education, never gets a college degree.

Second, a federal study of job prospects for the next decade, done by the U.S. Department of Labor's Bureau of Labor Statistics, predicts that 8 out of 10 openings will not require any college degree.

And finally, 14 million persons should be receiving some sort of vocational-technical education by 1975. In 1968, only 3.8 million were getting such training in the secondary schools and nearly 25% of the young people who turn 18 each year have not been educated to a level that can be considered adequate for employment.

Most of the nation's approximately 1200 area vocational-technical schools which serve several school districts or a number of counties, are located apart from the secondary schools. The National Advisory Council has maintained consistently that a separate vocational school or distinct vocational track should be the exception, not the rule, in a technical and changing society, and that all students must be allowed to move into and out of vocational-technical programs and to select mixtures of vocational-technical and academic courses.

The major fact is that the community has to be sold on the idea that there are all kinds of ways to make a living. Practicing medicine or law is just as much a vocation as being a mechanic.

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[3]Adama, Velma A. Vocational Training: Still For Someone Else's Children? School Management, Sept. 1970, p. 12.

But it's up to the educators to help people be realistic about the fact that they are going to have to work all their lives and that they--and their children--must prepare for a job at which they can be productive and successful.. The most effective way to win support is to involve the community in school planning. Using the umbrella designation "occupational education" instead of industrial, vocational, technical or a combination of these terms--may also clear up some confusion and help to win acceptance.

When an individual makes up his mind to do something, that is when a course should be provided. It's a mistake to tell a student when he should learn something, when he should decide on vocational education or college.

The following major recommendations are made in the third annual report of the National Advisory Council on Vocational Education.

1. Recognize that employment is an integral part of education. Every secondary school should be an employment agency. Schools which provide vocational education without also providing a job--should not have full vocational funding. A school in which getting a job is part of the curriculum is more likely to have students who understand why reading and mathematics make a difference than is a school which regards employment as somebody else's business.

Part-time employment should be part of the curriculum. Where the labor market does not provide enough part-time jobs for students who are not learning desirable employment habits at home, the work-study program under the vocational Education Act should be adequately funded and utilized as a substitute for work experience in private employment.

Schools should invest as much in follow-up and counseling for those who drop out as for those who remain in school. Where our educational system fails young people is not so much in its inability to halt their early departure from school, as in its failure to recapture them later.

2. Give priority to programs for the disadvantaged without separating them from the mainstream of education.

3. Encourage parents and students to participate in the development of vocational programs.

To attract the clientele which can profit most from vocational programs--students whose career training must be acquired in secondary school--educators must involve clientele in planning and direction by creating advisory committees of parents and students.

4. Establish residential schools for those who need them most. Adolescents who cannot cope with their homes or their neighborhoods are the students who would benefit here.

Experts predict that productive citizens in the next decades will have to be retrained in at least four to six vocations in a lifetime. Vocational education, therefore, is a challenge to provide programs not for youth alone but for students of all ages. The vocational education program and the facilities designed to serve it will be called upon for constant manpower retraining and retreading. Thoughtful planners will design facilities with the flexibility required to meet these considerable and diverse needs.

Employment practices favoring the high school graduate with a

salable skill have an impact on programming and school design. The dropout problem is not new and is far from being solved. It is believed by many that the establishment of innovative programs and schools or centers with multilevel vocational programs will help to retain many students. Unmet vocational needs may be responsible for many student's lack of interest in their school work. Slow learners, lacking the aptititude for highly technical training and the ability to enter college, need help. They too must live, they too must work, they must enjoy the image of a self-respecting citizen in a productive society. Vocational-technical education should not be considered merely a program for the slow learner or potential dropout. The program should be designed to meet the abilities and needs of each individual student--whether he be dull or bright--and the demands of an ever-expanding labor market.

Young people are planning their careers earlier than ever befor; to be sure, their plans may be tentative, but they are giving serious thought to their futures. Schools all across the nation are expanding vocational guidance services to help students to identify their interests, their aptitudes, their strengths, and their weaknesses. Sights must be realistically set to avoid frustration and failure. With the wide range of abilities, interests, and aptitudes represented in a true sampling of large school systems, the scope of training, both academic and vocational, is limited only by one's imagination.

IDEAS & METHODS INVOLVED WITH VOCATIONAL EDUCATION

A new educational era is in progress--a time of redirection in our public school systems towards an emphasis on career orientation. Our educational system is called on to direct its efforts more to the community to cope with the problems of school dropouts, the unemployed, the underemployed, and the massive socio-economic problems of our urban and rural societies. To effect changes in vocational-technical education facilities towards implementation of this total program idea will require a master plan which reflects a sensitivity to community needs and incorporates these needs and the supportive educational program into a highly sophisticated planning idea and method of fulfillment.

The challenges ahead demand that vocational facilities be flexible, capable of adapting with minimal time and expense to the rapidly changing technological advancement in industry. This is the reason that the deficiencies of normal planning procedures have too often proved to be costly and ineffective in meeting total program needs. A systematic approach to planning is called for, a system of planning which will identify and clearly define (community goals and aspirations, (2) educational objectives, (3) human resources, (4) financial resources, (5) program of action, (6) alternatives, (7) decisions, and (8) evaluation procedures. Systematic planning becomes a tool that requires the user to proceed through a series of orderly sequential steps towards the solution of a series of specific problems.

School buildings must be designed and built to meet the needs of those using them and to fulfill the educational objectives of the community. The following are typical of the factual data necessary to schoolhouse planning for vocational and technical education.

*The socioeconmic and ethnic composition of the immediate community and adjacent communities.

*The civic and social aspirations of the various community groups.

*The educational posture of the community.

*Business and industrial outlook for the community (growth?) and (decline?).

*Potential employment opportunities and basic job entry requirements.

*Student aspirations.

*Existing school facilities and capabilities.

*The vocational-technical programs needed.

Anticipated support from leaders in business, industry, and labor.

*The involvement and input that can be expected from leaders in business, industry, and labor.

*The involvement and input that can be expected from the utilization of advisory and craft committees.

When all the evidence is in, the next step is to develop the

rationale which will translate educational needs and resources into educational specifications that will enable the architect to design a functional facility.

Guidelines for developing educational specifications are:

**Make a detailed study and survey of the problem.
*Determine educational needs.
*Consider all possible resources.
*Define goals and objectives.
*Develop an educational master plan.
*Evaluate all phases of curriculum needs.
*Recheck all the above in relationship to student needs.
*Program a financial budget.

The answer to our complex manpower situations is found in the vocational-technical education school. The unprecedented demand for trained personnel results in an inordinate burden being place upon existing school facilities. Instructional equipment becomes outdated or inoperable through overuse; laboratories and work areas suddenly shrink as class size increases; and work loads of administrative and educational personnel reach unachievable limits. In those communities where no vocational education facilities exist, the problems can be even more confusing because of the lack of an evident starting point. In either case, the evident solutions have been: (a) expand the present school plant, or (b) create an entirely new vocational education campus. It is into the category (b) that I feel Great Falls should be placed.

In order to plan the vocational-technical school itself, there are many guidelines to be followed. I will explain them now in a little more detail and they are what I will attempt to follow. First of all, a realistic program of space requirements must be developed. The written program of educational and space needs is the prime document in communication between the school and the architect. It is evident that proper attention must be given to subject technology, their changes and new emphases. The important thing, however, is the teaching of technology--how those changes will be taught--through audio-tutorial, simulation, computer assistance, or other means. Other areas of education where training programs must be accomplished quickly and effectively should be examined. Private industry and the military may have some good ideas to offer which they are using to solve their problems.

Educational goals can affect efficiency and, hence, the cost of the facility. A major expense in vocational education today is represented in laboratory equipment. The more students that can be taught with the same equipment makes for a reduced overall cost-per-person. The investment in laboratory equipment can be minimized through use of audio-tutorial methods utilizing films, slides, and taped instructions presented in multi-purpose carrels.

The translation of educational goals into a space program requires special skills. Providing those skills is the educational consultant, serving as a bridge between the educator and the architect. In conferring with the educational consultant, one must be realistic in establishing space requirements. Disappointment can be the only result from programming beyond a budget. Because vocational education has been squeezed so long, t he tend-

ency to over-program is a natural result. It is far better to defer a program of instruction, rather than have the entire project prove inadequate in many areas upon completion.

High quality of design and construction is essential in any project. It is especially true with the vocational school, since there is a necessity of upgrading the total image of vocational education. I'm setting my design sights high; they establish the character for future growth. Disappointment in the initial development can prove disastrous in generating community backing for future projects.

The building program must be flexible and able to be modified as building plans develop. The area to start with is the big, general area--types of programs of instuction to be housed--then the focus is on details, such as the equipment. Expansion capabilities of instructional areas will influence the actual amounts of space required, particularly if expansion is planned by the addition of equipment, rather than space. Room configuration affects the overall efficiency of any structure; the building program should be modified as such room shapes become known. The final summing-up for each room is determined when equipment is set into the assigned space.

Such programming involves the use of a tally sheet to keep current on assignment of space and equipment. The entire site must be programed, including the needs for outdoor instructional spaces, service requirements, parking, and athletic fields. Horticulture classes may require fields for growing specimens; construction courses may require fenced-in areas in order to safeguard equipment.

A second important step is to prepare a graphic analysis of the educational program to reveal the individual character of the school being planned. A spectrum is a good analysis here as to the formation of the many educational programs; the nature of each program eases gently into the next program. Such a concept of spectrum shadings of these many adjunct factors will dramatically illustrate the inter-relationship of the programs. It will also reveal the related service spaces necessary for each--storage, lockers, receiving capabilities.

The accompanying Program Analysis charts illustrate such a vocational program-activity spectrum, valuable in planning the blending of active work areas with lecture or instructional areas. Ultimate growth of the plant must be considered. Those spaces which must eventually be enlarged must be indicated and how much they will be enlarged must be estimated. Since changes are continually occurring, growth should only be defined in the most general terms for those areas that are in the most distant future.

The graphic analysis reveals the administrative organization, the important relationships of staff to students, and interaction among faculty and administration. Customarily, within vocational schools, the instructor has had his office next to the laboratory in which he teaches. Such a practice tends to establish a kingdom and has its conveniences, but also limits the instructor's association with other faculty members, administrative and guidance personnel. This should be remembered and the possibility of locating

such offices away from the laboratory, but in close proximity to other faculty offices and available to areas of student concentration should be a major consideration.

A properly prepared program spectrum should mirror the economic composition of the area--whether it be industrially oriented, agricultural in nature, or a center for health services. Such a series of graphic analyses will be the first visualization of the educational program, and will incorporate community growth factors as they reflect upon the vocational school.

Increasingly, extracurricular activities of the community are being conducted within the school plant, including health programs, cultural programs and professionally oriented organization activities. Thus, the community's social structure also is reflected in this analysis.

Next, an analytical approach to a site selection must be adopted. The resolved educational program, when combined with the site, will determine the form or shape of the future building. In contemplating possible sites, downtown locations must not be overlooked. Quite often entire blocks of buildings are available at reasonable cost. Renovation of some buildings and removal of others may become a welcome and economic reality in conjunction with the community's urban renewal program. Such a procedure can permit the school to establish good-neighbor relations with the business community.

Other advantages that can be gained through locating the school in the downtown area include the opportunity to utlize the existing public transportation; cooperative instruction programs with community businesses may be more readily established; and it puts the students where the action is.

The next consideration is a system of zoning to facilitate orderly growth and change. As illustrated in the accompanying chart, a hierarchy of noise, dirt, and action levels attendant with the various instructional spaces is established. Groups of areas with similar requirements are identified and educational zones established. The relationship of each zone to each other zone must be defined. Next, confirmation of the relationship of instructional zones to common facilities; cafeteria, student center, library, lecture facilities, wash rooms, main entrance, and service areas.

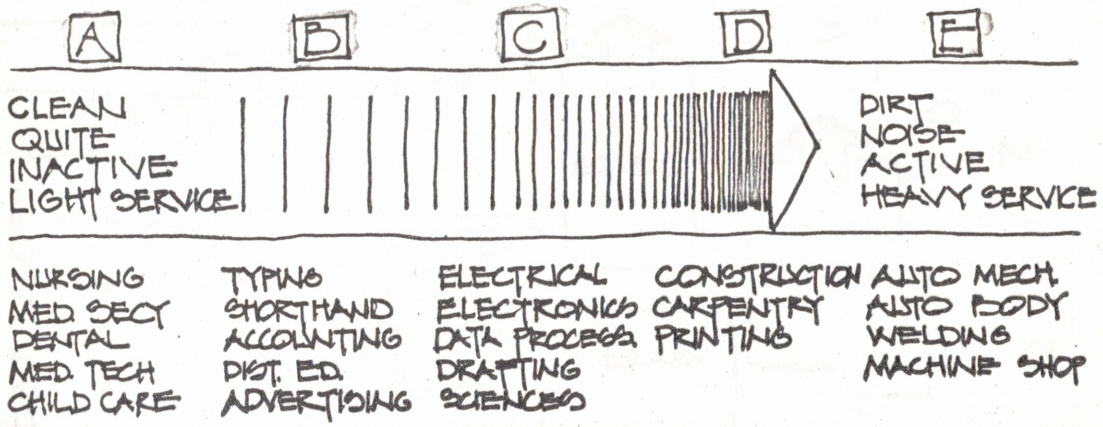
Educational space arrangement also will be influenced by the topographical nature of the site; the need for access to the building; necessity for parking facilities; and a desire to take advantage of an attractive vista.

A wide variety of spaces and services must be developed within and throughout the building system. The total building system is a composite of many subsystems, all of which must be organized and interrelated to permit expansion and adaptations. They include:

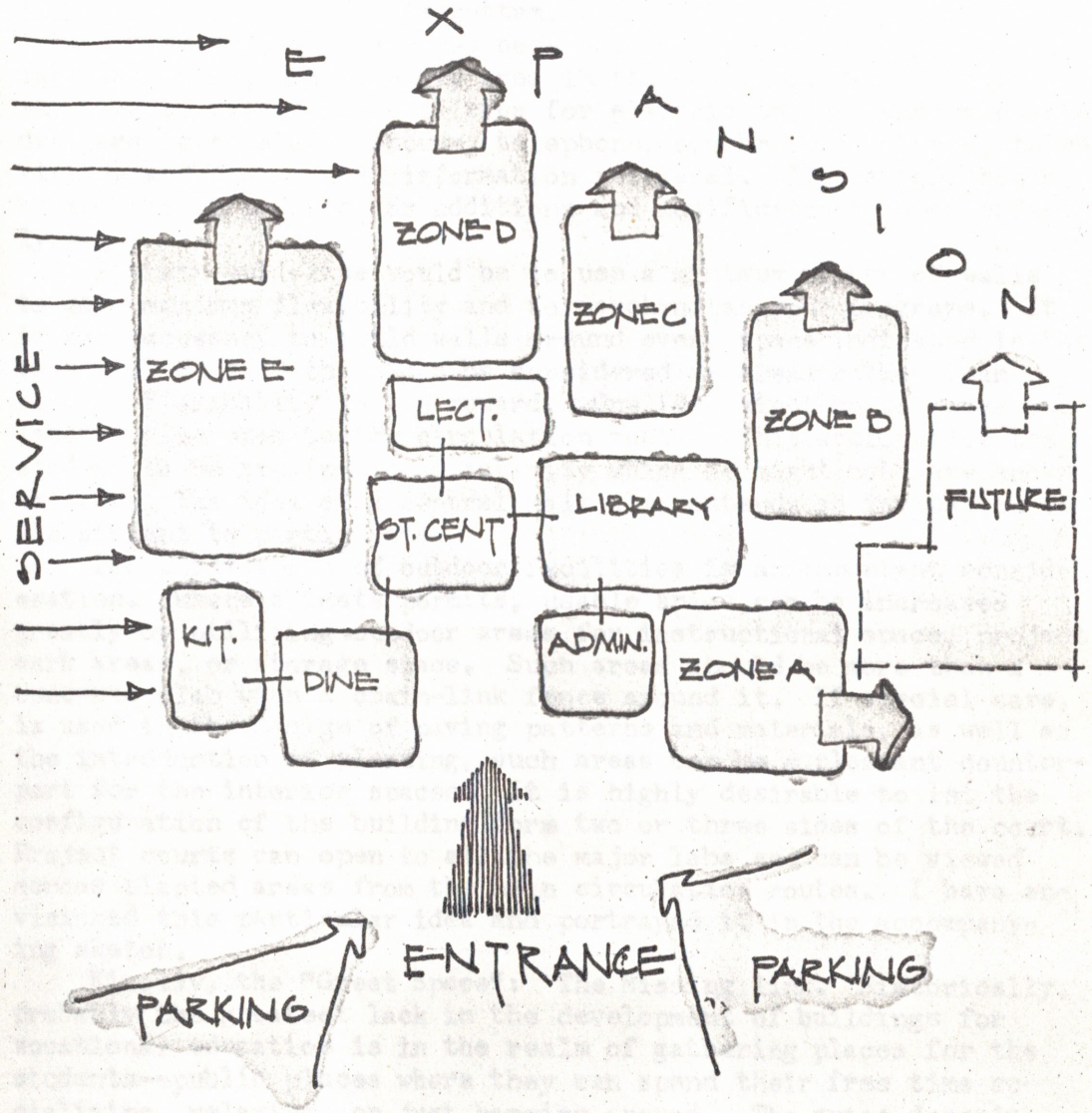
Space System: Heavy laboratories and shops require larger unobstructed areas and frequently higher ceilings that general-purpose classrooms, offices, and storage spaces.

Personnel Circulation System: Provides for the routing of people to various areas of the school Attention should be given to the directness and efficiency of this system and also to the experiences along the way. Thus, students can be exposed to fields

INSTRUCTIONAL ZONES



oooooo THE SETTING UP OF TYPICAL INSTRUCTIONAL ZONES ooo



oooo TYPICAL ZONE RELATIONSHIPS ooooo

of study other than their own. Areas for exhibits, alcoves, lounge seating, and oasis areas with vending machines and tables offer variety and increased usefulness in this system.

Comfort System: Provides heating, ventilation and air conditioning capabilities. Recent years have seen an increasing demand for year-round air conditioning. In many places it is required that vocational facilities be air conditioned. This increase in comfort requires a corresponding increase in the space required to house the system. Expansion of facilities is a major consideration in the layout of this system.

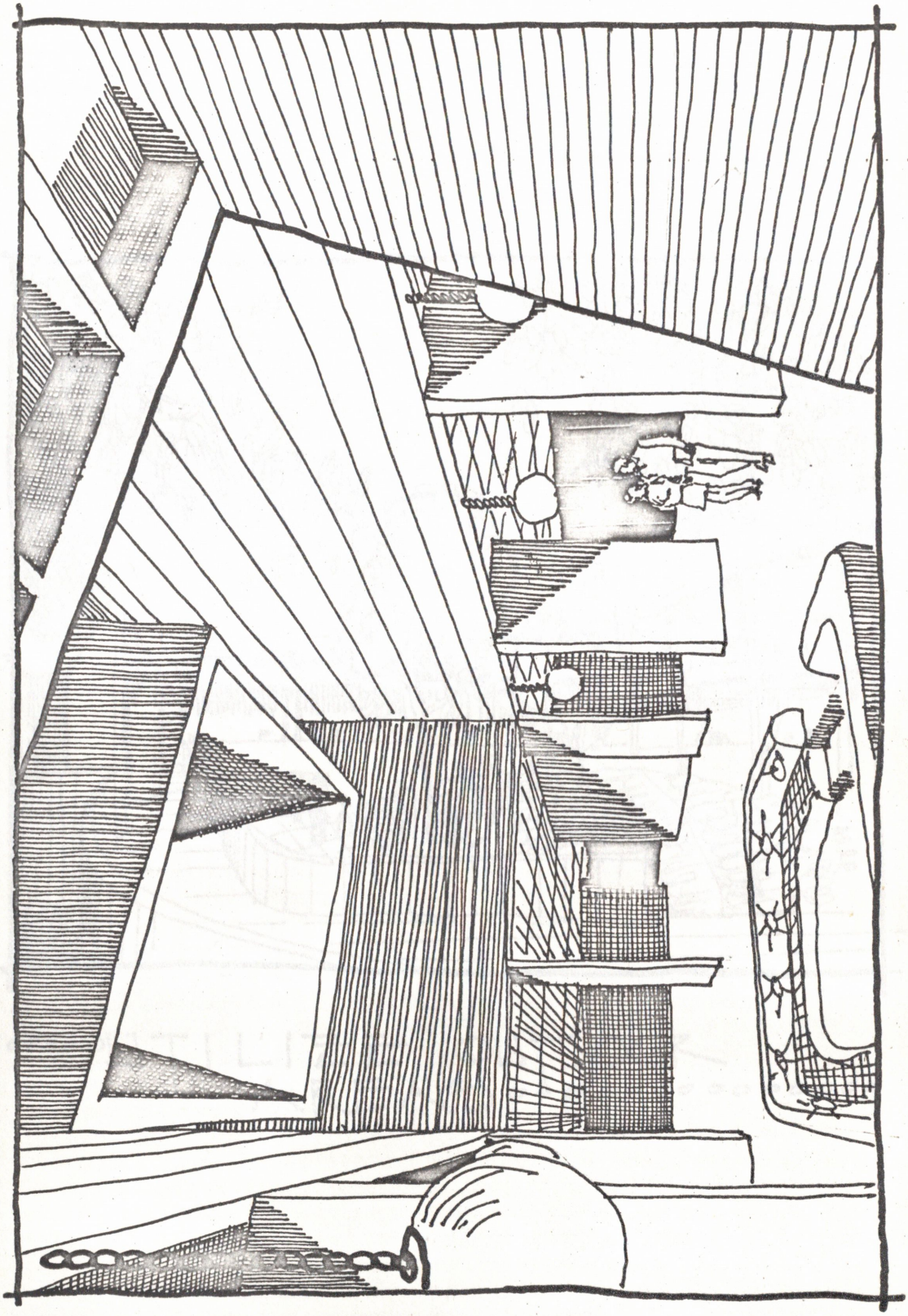
Utilities System: Provides necessary utilities not only to labs and shops, but to every area in the building. This system may have to provide capabilities for electricity, hot and cold water, drainage, gas, steam, vacuum, telephone, synchronized clocks, television, and dial access information retrieval. Its design should be such as to provide for additions and modifications in an orderly way.

A sixth guideline would be to use a minimum number of walls to gain maximum flexibility and to merchandise your programs. It is not necessary to build walls around every space indicated in the program. Many of these can be considered as areas rather than rooms. Flexibility is the reward. One idea might be to leave the laboratories open to the circulation route. This would allow the student to be exposed to an activity which he might not have known existed. The idea of a central mall also extends an invitation to the student to participate.

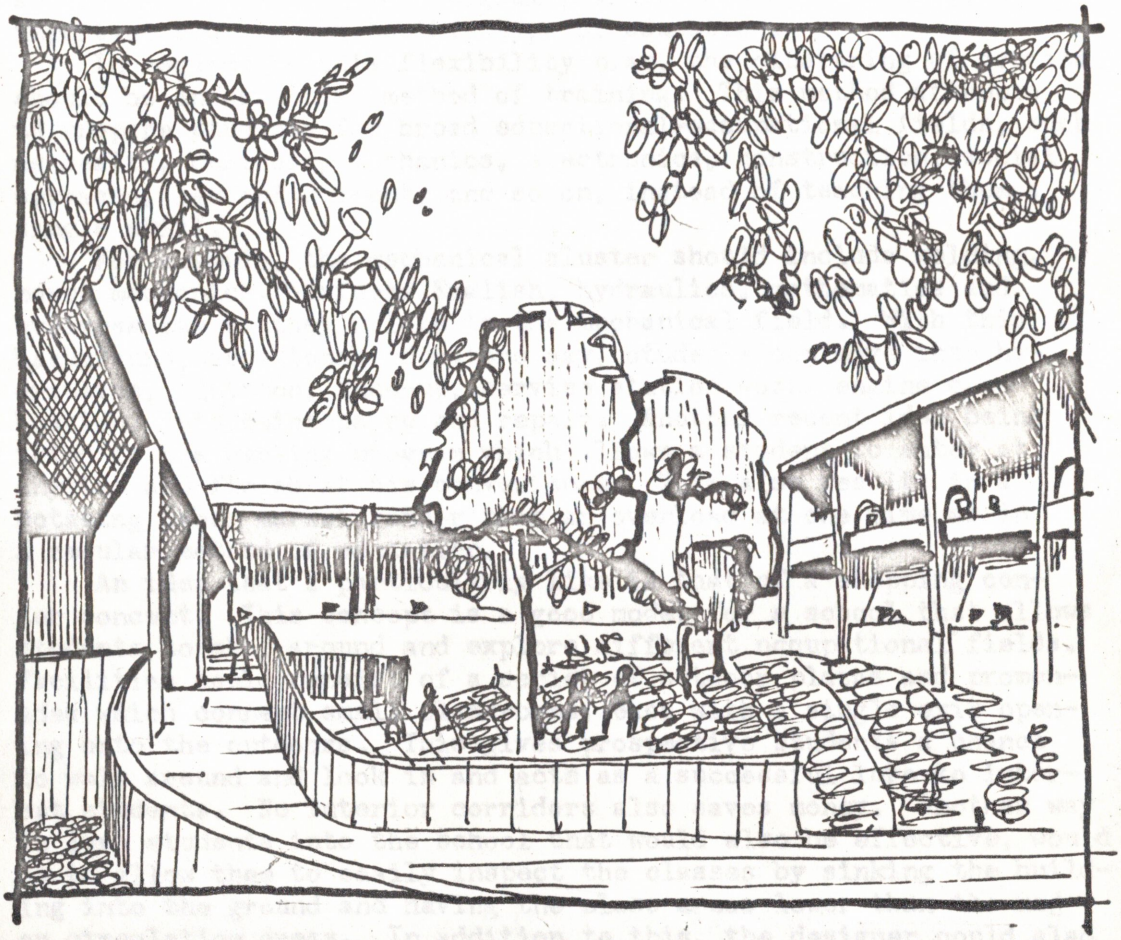
The utilization of outdoor facilities is an important consideration. Where climate permits, usable space can be increased greatly by utilizing outdoor areas for instructional space, project work areas, or storage space. Such areas should be more than a concrete slab with a chain-link fence around it. If special care, is used in the design of paving patterns and materials, as well as the introduction of planting, such areas can be a pleasant counterpart for the interior spaces. It is highly desirable to let the configuration of the building form two or three sides of the court. Project courts can open to all the major labs and can be viewed across planted areas from the main circulation routes. I have envisioned this particular idea and portrayed it in the accompanying sketch.

Finally, the "Great Space": The Missing link. Historically, probably the greatest lack in the development of buildings for vocational education is in the realm of gathering places for the students--public places where they can spend their free time socializing, relaxing, or just hanging around. The space doesn't need to be grand, but it does need to be existent. This is the space that is long remembered by the student after he leaves school. It is reminiscent of the village square. This idea is also portrayed in my accompanying sketch.

Vocational-technical education must be geared to reality. Facilities should in general reflect the training demands of occupations, of the employers of the ultimate worker, rather then merely the wishes of educators or architects. If these groups agree on facility design, a happy family of planners may be the result.



the "GREAT SPACE"



UTILIZE OUTDOOR AREAS

The vocational center may well operate over a considerably longer day than most schools. It certainly should operate during the regular school day, in the late afternoon, during evening hours, possibly on Saturdays, and certainly during the summer months. The multiplicity of demands on this facility by both youth and adults calls for this continuity of operation. Vocational-technical students generally carry a full course of study, with no study halls provided. There are usually fewer electives than are found in a general high school. Many of the students will hold part-time jobs and will therefore attend school on an irregular schedule. Flexibility of program planning and scheduling is an important requirement to this type of education.

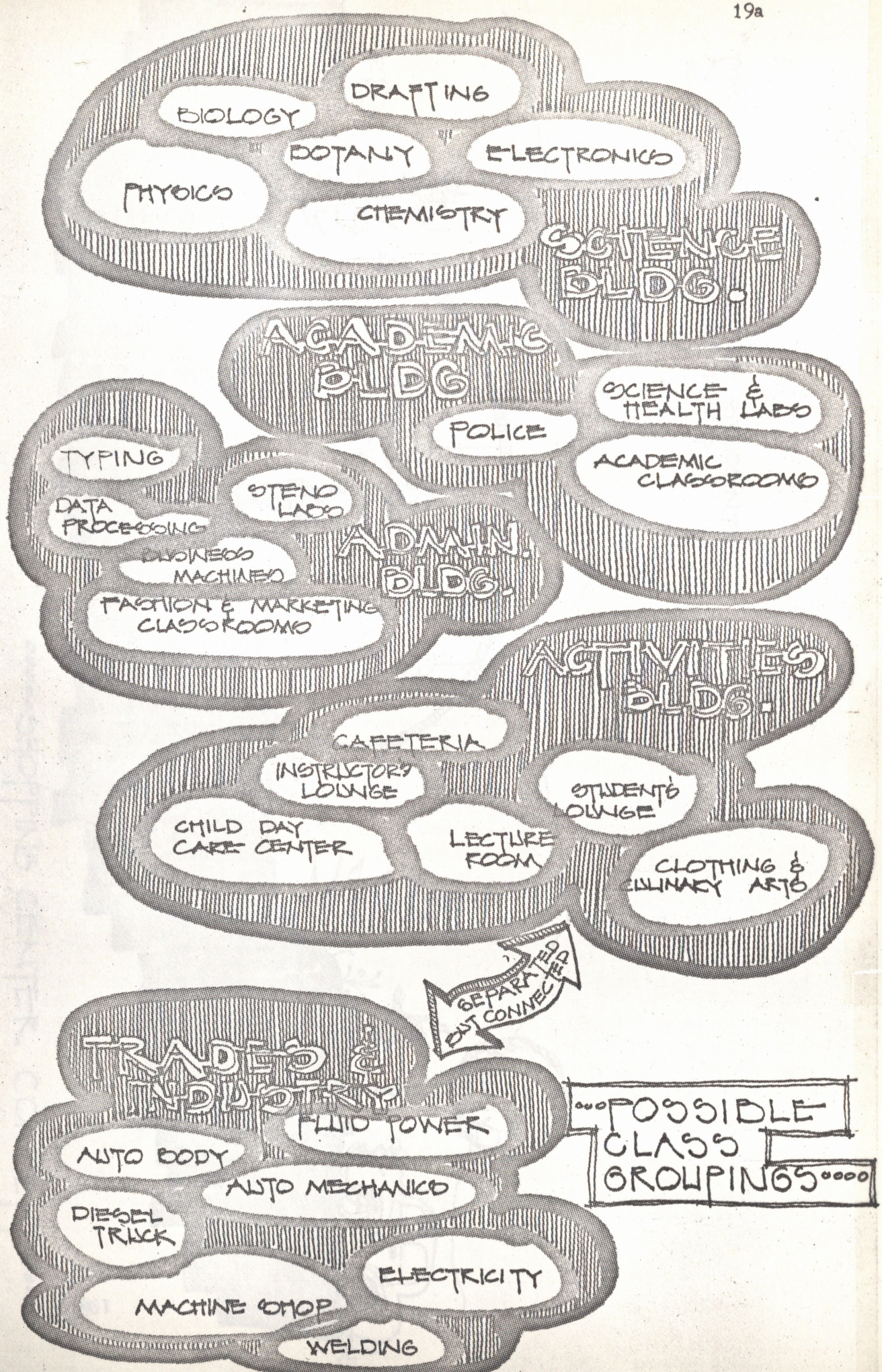
In regards to this flexibility plan, the clustering of courses should be an essential method of training. This method attempts to prepare students for broad educational-occupational fields, such as health, business, mechanics, electronics, construction, social services, law enforcement, and so on, instead of teaching them a single skill.

For example, the mechanical cluster should include welding, power mechanics, business English, hydraulics, mathematics and business law as they relate to the mechanical field. With this background, vocational educators say, students can move into hydraulics, ignition, tune-up, service station work, engine combustion, auto maintenance and repair. Another recent idea being tried is the cycling program which allows a student to enter at anytime and finish at his convenience. This also results in a rotating labor market rather than an overload at one time as in a regular method of education.

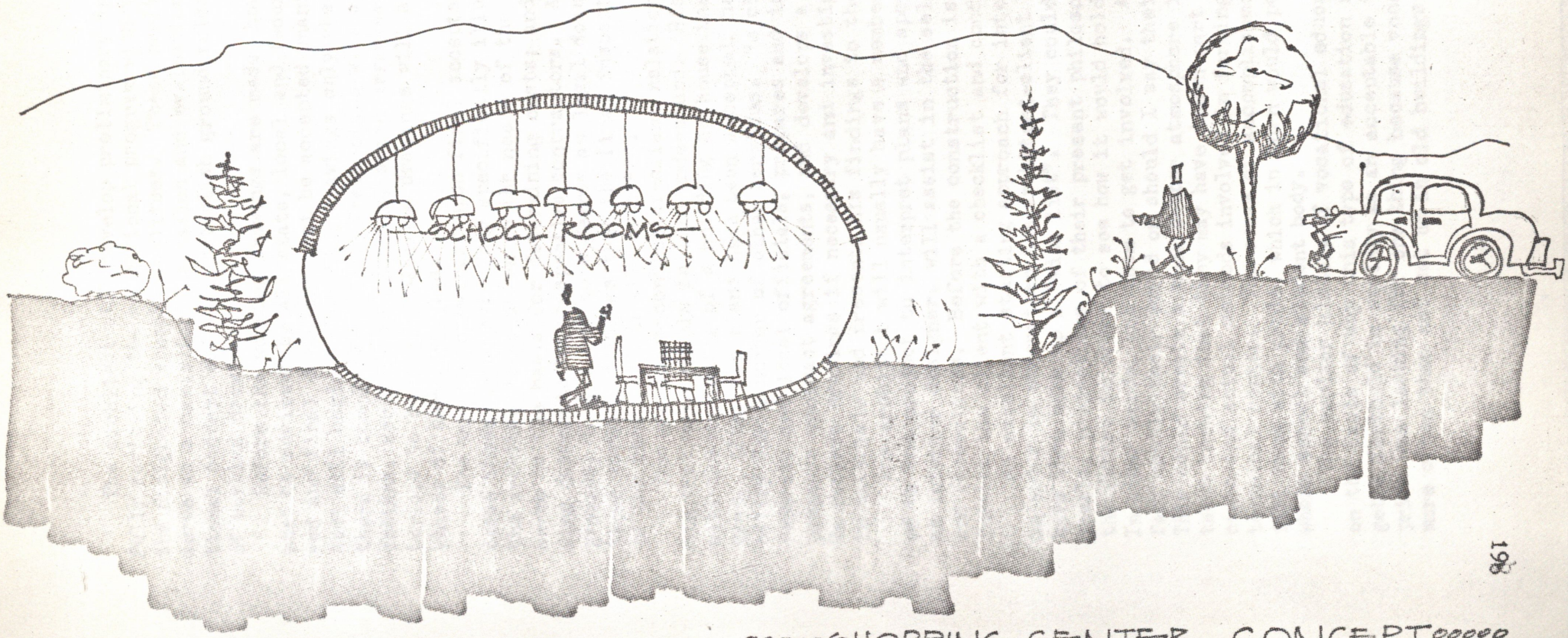
An idea that I particularly like is that of a shopping center concept. This concept is a good model for a school that allows students to shop around and explore different occupational fields. Facilities could consist of a series of outdoor plazas and promenades which connect small classrooms, each with a single exit opening onto the outdoors. This gives prospective students a chance to walk around and look in and acts as a successful lure to interest students. No interior corridors also saves money. Another way to lure students into the school that would also be effective, would be to allow them to easily inspect the classes by sinking the building into the ground and having the class areas lower than the major circulation areas. In addition to this, the designer could also employ modular techniques to provide easy expansion as needs arise, so that any or all of the buildings may be enlarged simply by adding bays.

The construction of an educational facility requires a team approach involving many educational and community groups and individuals. Their expertise and relationships will have a decisive influence on the educational program. Their relationships must therefore be clearly recognized and the assigned responsibilities of all groups and individuals clearly defined.

Before the architect can start to develop any preliminary drawings he must be thoroughly informed of the philosophy of the community and its aspirations. Educators and those who speak for the community must make their aims and objectives clear.


DRAFTING
BIOLOGY
BOTANY
ELECTRONICS
PHYSICS
CHEMISTRY
SCIENCE BLDG.
ACADEMIC BLDG
SCIENCE & HEALTH LABS
POLICE
ACADEMIC CLASSROOMS
TYPING
STENO LABS
DATA PROCESSING
BUSINESS MACHINES
ADMIN. BLDG.
FASHION & MARKETING CLASSROOMS
ACTIVITIES BLDG.
CAFETERIA
INSTRUCTORS LOUNGE
STUDENTS LOUNGE
CHILD DAY CARE CENTER
LECTURE ROOM
CLOTHING & CULINARY ARTS
SEPARATED BUT CONNECTED
TRADES & INDUSTRY
FLUID POWER
AUTO BODY
AUTO MECHANICS
DIESEL TRUCK
ELECTRICITY
MACHINE SHOP
WELDING
...POSSIBLE CLASS GROUPINGS....

"THIS GIVES PROSPECTIVE STUDENTS A CHANCE TO WALK AROUND & LOOK IN."



oooooSHOPPING CENTER CONCEPTooooo

The architect will develop preliminary drawings after carefully reviewing the educational program with the school staff and the designated school committees. These preliminary sketches will serve as a basis for discussion and evaluation of the total educational concept and will establish ground rules for the preparation of working drawings.

Before the working drawings are made, however, the sketches must be reviewed by all state, local and federal agencies involved and final decisions must be accepted unanimously. The architect will begin the working drawings only when he is assured that there is complete accord. These plans will show all the specifications, sections and details, space arrangements and kinds of materials to be used. Detailed drawings will also be made for all phases of service units.

The working drawings, upon final acceptance by the client, serve these purposes: They specifically illustrate in tangible form the architect's solution to the needs of the educational program; serve as the basis for determining costs; and are used as bidding documents by prospective contractors. As construction progresses, they serve to a degree as legal documents, and it is on these working drawings that the final inspection and acceptance of the construction will be based.

The architect-contractor-client relationship is an important one that many people fail to understand. His role does not end with the designing of a building to house the educational program.. After the plans have been accepted, he assumes responsibility for a number of other services. He checks with all state, federal, and local officials, prepares and issues bid documents, prepares contract agreements, and develops a method of payment. He refines drawings if necessary and investigates substitutions in materials and presents his findings to the school board.

The architect will usually have a member of his staff assigned to the project to interpret plans and specifications, and with an interior designer, will assist in the selection of color schemes and decorations. Before the construction is accepted, he will furnish the client with a checklist and conduct a final inspection.

An excellent starting approach for interviews of instructors, in order to strengthen the architect-client relationship, is to have them make up a "wish list". They could make sketches, proposals, projections of their present philosophy of teaching into the future in order to see how it would hold up in a changing world. In other words, ask them to get involved. After all, this is in fact mostly their world or should I say their place in the world. This could create a much better atmosphere in which to work and teach knowing that they may have taken part in the changes and concepts and actual methods involved in forming a modern vocational-technical center. The sense of accomplishment in this aspect would fill them with pride, which in turn would permeate throughout the whole school and student body.

The earlier history of vocational education throws some light on the facts of why this type of education has taken so long to get a foothold in society as an acceptable type of education. The pride was lacking for one thing because vocational education was more often than not set up in old buildings cast aside. In other

words, they were no longer acceptable for regular educational methods or uses, but the public seemed to think they were alright for the "lower" people who attended such schools as vocational-technical schools. These quarters were never suited to vocational instruction and therefore, placed these programs under a severe handicap. The attitude of most people alone was a handicap. Only after a program had proved its value, even when housed inadequately, new and more suitable space was provided. It is no longer as bad as all this and the present trend is to prepare for the introduction of a vocational program by building a facility of proper size and design, so that the program can get under way without the disadvantage of using a second-hand plant. The Vocational Education Act of 1963 recognized the need for proper housing by providing that a portion of the funds available under the Act may be used to construct area vocational schools.

Breaking the list of problems down, I would like to discuss each of them separately as I might face them in my design. These are general points to consider; my own for Great Falls will be separate.

The School Site

The site for a vocational facility will depend upon many variables. If it is to serve students from a wide geographic and sparsely-settled area, its location will be selected with this in mind. To serve a smaller and more densely populated area, a different choice of building site will be made, and in a large city, because of high land values, certain compromises may be necessary in site selection to avoid excessive costs.

Those who plan buildings for vocational programs should make every effort to achieve certain goals in selecting a building site. A prime requirement is that the building be accessible to the largest number of students. This means that all forms of transportation which may be used by those attending the school need to be considered in selecting a location. Adequate public and private means of transportation must be provided for. The planners should keep in mind that the vocational courses will bring attendance by large numbers of adults sho will drive cars and require parking space, in addition to parking space needed for staff. There is a growing tendency for vocational courses to enroll only the older high school students, and to serve more and more post-high school students. Many of these will use cars and this will add to the parking. All of this means that the size of the building site should be generous.

Another reason for selecting a site of ample size is to provide for future expansion. There is every indication that an increasing portion of the population will be enrolling in vocational courses. When this fact is coupled with projected population growth, it would appear that most vocational buildings being constructed today will need to be expanded at some future time to meet growing needs. Sites being selected now should be large enough to permit future expansion, both in buildings and in auxiliary outdoor space.

A vocational program includes courses which need a certain amount of out-of-doors areas for instructional purposes. Such occupations as automobile mechanics, building construction, landscaping and horticulture, and others, cannot be taught effectively without access to outdoor areas, and the size should make provision for such needs, even though some of them may be in the future.

The Building

Buildings for conducting vocational programs will vary in many respects, depending upon the needs, site features, costs, climate and design preferences of architects and local educators. When a vocational facility is a part of a comprehensive school plant, it will have to conform in certain ways to the overall design of the total structure. When a building is being constructed for vocational purposes only, there is no need for relating it to a building which is used for other educational programs, and this permits more freedom of planning. The importance of providing for future expansion has already been mentioned before in connection with site selection. In the planning of a building, future expansion must be carefully considered. Expansion may be achieved by adding additional stories to a building, and in this case the necessary structural strength to permit upward expansion should be built into the original structure. Ready access to water, plumbing, heating and electrical services for the additional floors should also be planned for. If the expansion is to be accomplished by attaching additional units to the original building, rather than by adding additional floors, the original building must be placed on the site with this in mind. Again, provision must be made for tapping into service lines with a minimum of difficulty when the additional space is added. Wherever a heating or air conditioning systm is used, thought should be given to the additional capacity which will be required if expansion becomes necessary.

Types of Buildings

All things considered, the single story building is generally preferable for a vocational program. In this case the need for stairs and stair climbing is eliminated, and this is even more important in a vocational than in an academic building. Vocational courses often require large and heavy equipment for instructional purposes and this equipment has to be cahnged and replaced periodically as it becomes out-dated. Handicapped people also may be attending the school and it makes it far easier for them. The courses also require a far greater supply of instructional materials than do courses of an academic nature. These materials are heavy, bulky, and not easily handled. Therefore, when shops or laboratories are located above the ground level, serious problems arise in transporting equipment and supplies to the upper floors of the building. Costly lifts and freight elevators become necessary. Extra strength must also be built into the structure to support heavy equipment if it is to be used above the first floor.

Nevertheless, in locations where site costs are very high, as in cities, it is sometimes necessary to build multi-story vocational schools, because sufficient land area is not available for a one-story building. In such cases satisfactory buildings can be designed, providing that all the problems of installing equipment, delivering bulky supplies, moving vehicles in the building, and moving people between floors are anticipated and provided for. An arrangement which has been used successfully in some places has the shops and laboratories in one-story wings, with ample delivery and service areas adjacent, while the central part of the building houses classrooms and offices and is constructed with two or more floors.

The I Type

Three general styles of buildings are finding frequent use in the various parts of the country. These are the "I" type, the "U" type and the "Campus"type. The "I" type building consists of a center section, with a wing at each end placed at right angles to the center, each wing forming a "T" with the center structure.

The U Type

The "U" type building is very much like the "I" design, except that the wings form a "U" rather than a "T" with the center section. The court formed by the "U" can be partially paved for delivery purposes, or of course, landscaped for an attractive appearance.

The Campus Type

The "Campus" type of structure makes use of several separate units, each having two or more shops or laboratories of the same general nature, sometimes connected with covered walks to a central building which usually houses administrative and related functions. The campus arrangement requires a relatively large site. Community colleges and technical institutes often make use of the multi-building arrangement, with separate buildings for shops, laboratories, classrooms, libraries, food service, and administration.

Shops And Laboratories

Most vocational courses require shops or laboratories for teaching the practical aspects of the various occupations. These usually need to be much larger than the usual classroom. The actual floor area needed will depend upon the nature of the instruction and the equipment to be used. Provision should be made for at least twenty or twenty-five work stations, with additional space for the instructor, for storage, and for general needs. There are no square foot per pupil standards which can be applied to all shops, but in planning the shops and laboratories, it is better to be generous in allocating space than to find later that the space allowed is inadequate. The provision of plenty of working space for students is among other things, a safety feature.

Demonstration and Planning Areas

In addition to the space needed for actual work stations, every shop or laboratory should have a suitable group instruction and demonstration center. Also accessible should be a student-teacher planning area, equipped with tables and chairs, a shop library, chalkboard, tackboard, and facilities for using audio-visual materials. In some places this has been achieved by constructing a glass enclosed classroom-workroom in one section of the shop area, or located to serve two adjacent shops. The glass enclosure permits easy visual supervision by the instructor of students at work in the center, or of the shop area when the instructor is inside the planning center, working with the students. At the same time, such a center becomes a very useful auxiliary space, free from the noise and dirt of the shop, and well-suited for individual and group learning activities related to the actual shop work.

Special Services and Provisions

Most shops and laboratories will need special mechanical and electrical services which are not found in ordinary school teaching space. These may include water, gas, special electrical lines,

compressed air, and, in some cases, piping to supply gases, as for welding. Some types of shops will need special ventilation and exhaust systems. Certain subjects, such as food preparation, and health occupations must meet special sanitary requirements of State and local codes. All such matters should be carefully investigated before a building is designed. Also to be considered is the possible use of the same space for quite different occupations, and, to extent possible, the flexibility in construction which this implies.

Tools and Supplies

Shops must also have adequate tool storage and distribution arrangements, and facilities for receiving, storing and distributing instructional supplies. A tool room separated from the teaching area by open wire-mesh partitions has much to recommend it. It is light, well-ventilated and subject to visual supervision. It can also be readily moved, adding to flexibility.

Mention has been made of the need for having each shop capable of receiving direct delivery of supplies and equipment. This is the great value of the ground floor shop, placed at grade level, with full outside exposure. Over the years a tremendous amount of material handling will be avoided with such an arrangement. Plenty of storage space for supplies and materials, readily accessible to each shop, must, of course, be provided. Most shop require an auxiliary room. In addition, for many occupations, storage space for students' materials is very necessary.

Other Facilities

Toilet and sanitary facilities should be carefully planned. Small, one or two station toilets accessible from each major teaching area are in many ways preferable to fewer, larger and more centrally located units. The cost, however, may be greater. The age and maturity of the students to be served may be a factor in making this decision. In addition to toilets, all shops will need adequate drinking fountains and ample washing facilities. Many excellent units for group washing purposes are on the market. For some types of work, such as foods, health, and certain building trades, showers may be desirable or may be an actual requirement. Showers and dressing rooms need to be adjacent to the instructional areas they serve. All shop areas should have locker space where students can place shop clothing.

Many vocational courses are not taught in shops, and teaching areas suitable for the subject to be taught must be provided. Some of these are quite specialized, such as courses in the retail store environment which may be needed for the distributive education courses, the hospital-type facilities used to teach nursing, and the office-like arrangements for business education. Whatever the demands of the particular curriculum may be, certain general features need to be emphasized. Among these are generous amounts of space and appropriate dimensions for the activity involved.

CLASSROOMS AND OTHER SPACE

The amount and kind of sapce needed in addition to shops and laboratories will depend greatly upon the type of program planned for the building, and the students to be served. When the building is to provide only for the occupational courses, the only additional space required will be for administration, library, guid-

ance and a first-aid clinic, together with general sanitary facilities and necessary classrooms. Where students are to attend on a full-time basis, some provision must be made for food service.

In a building which is to provide for the entire education of the students, academic as well as vocational, it will of course, be necessary to include all the features of a complete school. This will call for all necessary classrooms, general purpose rooms, conference rooms, library, sanitary and health facilities, arrangements for feeding, and very possibly an auditorium and facilities for physical education.

EQUIPMENT

The equipment to be used in teaching a vocational course should be of the type and variety found in places where the occupation is practiced. This is a part of the effort to havelall vocational training be as realistic as possible, so that the transition of the student from school to job may be smooth and successful. The vocational educator is confronted with the constant need for keeping instructional equipment up to date and modern, because, with few exceptionns, this is the practice in the world of work. In addition, all equipment must be kept in good, safe operating condition.

Clearly, this calls for adequate funds, both for maintenance and for replacement. Nothing detracts more from the quality of a vocational program than the attempt to offer instruction with worn-out or obsolete equipment.

Detailed specifications should be prepared for equipment to be purchased. Trained vocational instructors, assisted by advisory committees, are usually the best source of information when deciding upon what equipment to install.

All equipment should include every possible safety device. Such protection is needed by every worker, and is especially important when inexperienced learners are involved. Many employers of vocational graduates have said that they value most the training in safe working habits which these graduates have received. Equipment should be placed in the instructional area with carful regard for safety, and without crowding. Every possible safety feature should be built into vocational shops and laboratories, including one or more master controls within easy reach of the instructor, which will permit instant cut-off of all power to machines and equipment. Provision must also be made for the safe storage of flamable materials.

ENVIRONMENTAL FEATURES

The planning of vocational facilities for day and night, year-round utilization adds the need for emphasis upon certain important features. One of these is lighting. The best possible natural lighting should be provided, and, in addition, excellent artificial lighting. There is some tendency to create windowless buildings in order to achieve more complete interior atmosphere control, and in such buildings all lighting is artificial. Adequate emergency exits from all rooms must be provided in accord with local codes.

The use of air conditioning in vocational buildings is well worth considering, and is essential for year-round use in many parts of the country. It is much more effective and economical when made a part of the original design and construction.

Many types of vocational instruction generate a considerable volume of noise. Acoustical control, through the use of modern acoustical materials is well worth the investment in terms of comfort and improved learning. This is also important in libraries, cafeterias, and auditoriums.

In planning a vocational building, full utilization of all forms of audio-visual communication should be anticipated. This may take the form of a comprehensive information and communications center which can receive telecasts and pipe incoming programs to individual rooms and shops. The use of closed circuit television for instructional purposes within the building should also be provided for. Full use of films, slides, microfilms, and video-taped materials, their storage and distribution should be planned for.

In addition to room and shop libraries, every modern vocational building needs a central library to house a constantly growing collection of technical and general materials. Such a library should be located in the building so that it can be open to non-students as well as students, and at times other than the usual hours of instruction.

LEARNING RESOURCE CENTER

This should be a broad area to provide the teacher with the assistance to be found in a multimedia center. This is the heart of the institution. It is a gathering place for staff and students, for purposes beyond the circulation of books. All duplicating machinery, A-V equipment, all aids to the teacher, are kept in this part of the institution.

With closed circuit television, an average teacher can bring a specialist into the classroom. Video tape makes it possible for a student to review a lecture or demonstration again and again. Individual carrels can be set up for this purpose.

The esthetics are an important consideration: comfortable furnishings, carpeting, drapes, use of color and music wherever applicable.

FLEXIBILITY AND ATTRACTIVENESS

Reasons for planned adaptability in vocational buildings have already been given. A building once constructed, is likely to be in use for many years. Yet the kinds and nature of the occupations which are taught in it undergo change, and it is probable that these changes will be more and more frequent and complete in the future than in the past. A completely flexible building may be impossible to design, but there are certain arrangements which can be a part of the original structure and which will greatly increase the ease of accomodating program changes through different uses of the same space. One of these is to avoid as much as possible the use of interior load bearing walls, to use as few interior partitions as possible, and no partitions of a permanent type. Large, open-floor areas are the most desirable. Various occupational activities can be conducted in such areas with as few separating walls as possible. Such separation as may be necessary can often be achieved by partial partitions, wire mesh separators, or other devices which can be easil removed and rearranged if necessary.

To add to the freedom of space use and to facilitate different use of space, much is gained by having power and other essential

services available from a grid of overhead lines, or a floor grid, so that service to individual pieces of equipment can be easily provided to any spot on the area floor. It is more difficult to provide flexibility with water, sewer and drainage services; but consultation with experts in these matters can often result in a degree of flexibility which would otherwise be much more limited.

Corner Room Concept. A unique feature of the academic building is the "corner room" and "middle room" concept. The teacher is stationed in the corner, which draws the attention of the student to the teacher by the shape of the room itself. Distraction is lessened, and more information can be absorbed by more students. In the traditional classroom, about a fifth of the square footage is waste space in the front of the room, which is occupied by the instructor and his desk.

In a corner room, waste footage is reduced from one-fifth to about one-ninth of the floor space. When the three rooms that occupy each corner are expanded into one room by drawing back the flexible walls which divide them, 105 students can be accomodated where 35 students were placed in the corner rooms. The "middle rooms" follow the same concept.[4]

In conclusion, there is no reason that in the construction of vocational facilities every effort should not be made to achieve an attractive as well as functional result. There is no reason why a building designed for vocational instruction should not have as much esthetic value, both exterior and interior, as any other modern school building. Business and industry have found that pleasant and attractive surroundings are not only appreciated by workers, but that they also improve the morale and attitudes of the work force. At the same time the facility becomes more of an asset to the community. The same is true of a school which is modern, attractive and well-designed. They will tend to avoid a program which is housed in dingy or unattractive quarters, and the image of vocational education suffers when this occurs.

There is also no reason in today's thinking to regard the vocational-technical center as anything less than essential in a total program of education. It is hoped that the day of regarding trade training as suitable only for the slow learner or the less able is a thing of the past. The nation's commitment must be sufficiently strong to provide the resources needed for forward-looking facilities for vocational-technical education. They need not be plain, they need not be lacking in esthetic appeal, and they certainly must meet the challenge of change which is upon us.

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[4]Concepts and Procedures for systematic planning of vocational facilities. Plan for Flexibility and Growth.
Jack Banerdt and Keith M. Stoehr, Kenosha Technical Institute. p. 30.

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CRITERIA

GREAT FALLS VOCATIONAL-TECHNICAL CENTER

FORWARD

The primary function of the Great Falls Vocational-Technical Center is to provide vocational and technical education for youth and adults in order to meet the requirements for gainful employment.

The program of the school is designed to respect the individual needs of the students and to assist in every way with the development of skills, abilities, personality and attitudes. Thus the individual will be better able to satisfy the employment requirements of business, industry and trades in a rapidly changing technology and to become adjusted and responsible citizens of the community.

The Great Falls Vocational Technical Center is presently housed in temporary quarters throughout the city. The main building being the old Washington Elementary School which is on loan from the School District and will have to be returned at some later date for School District use. The High School provides some temporary space, with much of the space being available only in the evenings. In these temporary quarters it is impossible to have the specialized equipment necessary to provide the best instruction in many of the specialized fields presently being offered. Lack of proper space also limits the number of students who may be served.

This is what prompted me to choose to design and plan a new vocational-technical center for Great Falls. It will benefit the community and will, in my opinion, give the students something to be proud of and be an enjoyable place to further their education.

GREAT FALLS VOCATIONAL-TECHNICAL CENTER

Administration

I. Introduction

As the professional staff of the educational enterprise increasingly demand and exercise their professional prerogatives, they, as a group, become correspondingly less a force to be directed by the administration, and more of a one to be organized and coordinated by it so that the best efforts of the best teachers may be effectively disseminated throughout the given administrative area of responsibility. The administrative area should recognize this trend in its design and location and, through these, should reflect a philosophy that recognizes the ultimate influence of the professional staff on the growth and development of the students, the curriculum, and the public image of the educational enterprise.

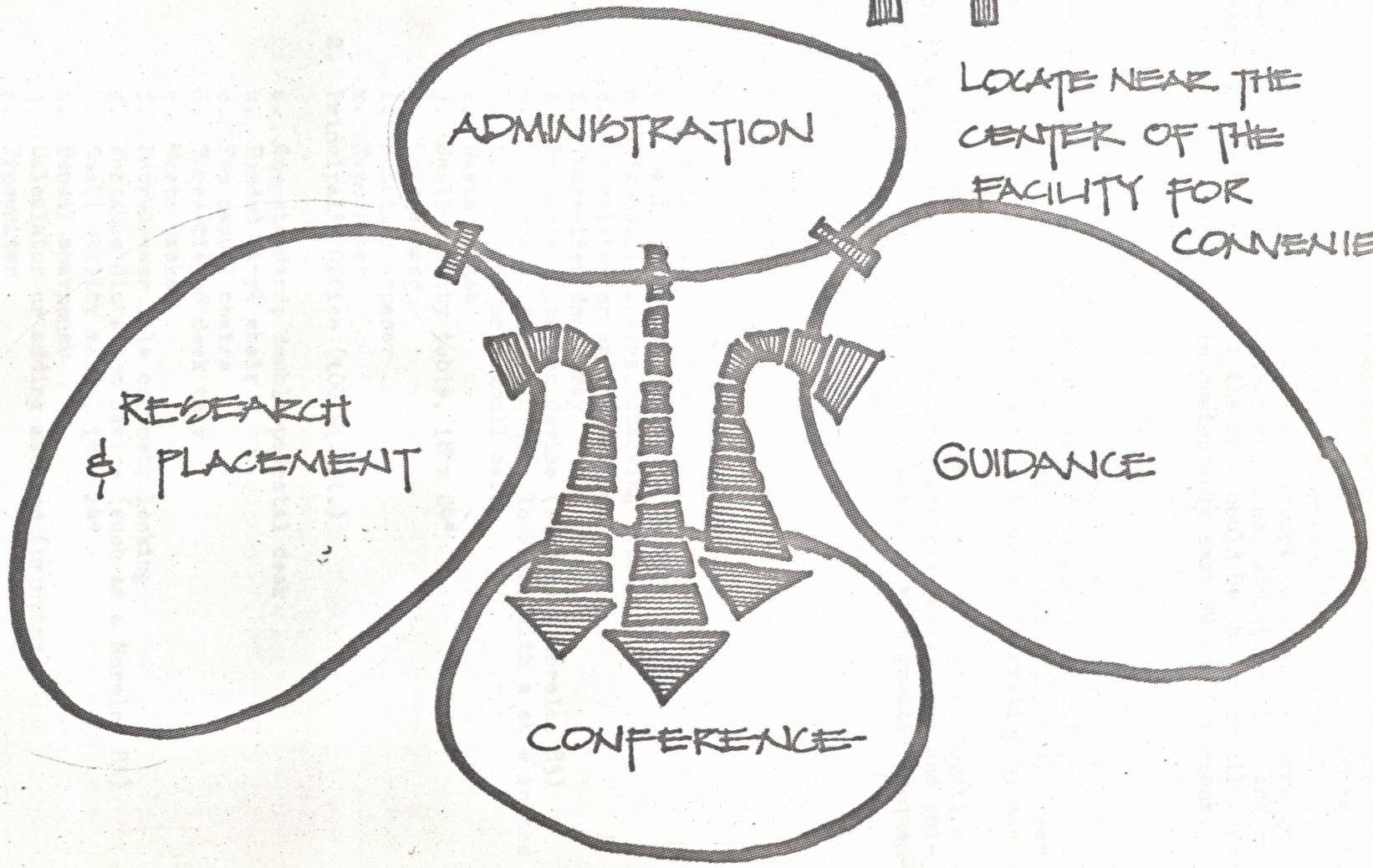
In the administrative area, the emphasis should be on effective, efficient communication. The essence of this is that the administrator is able to accomplish very little by himself. His effectiveness develops through his ability to persuade others of the goals of the institution or service can be best served through a team approach to the problems involved. The time has long since passed when an administrator at any level of responsibility could afford to sit back in his ivory tower and direct the efforts of his subordinates and reasonably expect to develop an effective instructional program.

The effective administrative effort is not only to communicate the best ideas and the most effective processes throughout the faculty, but also to make known the problems that may be encountered because of inexperience, new methods, equipment, etc. and to see that these are alleviated or avoided to the degree possible. The effective administrator must provide for the efficient use and optimum development of the instructional skills of his entire staff. A goal which can only be achieved if channels of communication within the faculty and between faculty and administration are given primary importance.

A. Space relationships

This area should be located adjacent to the guidance department and the research and placement department. It would be preferable to locate it between them so that the administrative personnel would have ready access to both areas. All three of these services should be located near the center of the facility to provide maximum convenience for anyone wishing to use them.

GENERAL OFFICES



LOCATE NEAR THE CENTER OF THE FACILITY FOR CONVENIENCE.

The administrative area would require an office for a director, a principal, and a secretary, as well as a room for group conferences to be held within the office without discomfort to the participants.....approximately 100 sq. feet. A conference room adjacent to the administrative area should also be provided which would allow larger groups to meet. An arrangement might be worked out between guidance, administration, and research and placement so that the room could be shared by all three. It should be large enough to comfortably seat 20 to 30 persons.

B. Traffic

Access to this area can logically be from almost any direction. However, consideration should be given to traffic patterns to and from the guidance area. Students will feel freer to use the area if their passage is not under observation by administrative personnel.

If this room is to be shared, the most logical location for it would probably be between the administrative area and guidance, as the latter would probably use this with greater frequency than would either of the others.

C. Furniture and equipment

1. Director's office (150 sq. ft.)

   a. One standard, double-pedestal desk
   b. Padded vinyl chairs
   c. Small conference table, 30" x 72"
   d. Six casual chairs, stacking type
   e. Calculator or adding machine
   f. Three-tier desk tray
   g. Portable dictation device (such as a Norelco 85)
   h. Four-drawer file cabinet, locking, with a safe in the top portion or a small safe
   i. Waste basket
   j. Small utility table, 18"x 24"
   k. Coat hanger
   l. Pencil sharpener
   m. Typewriter

2. Principal's Office (100 sq. ft.)

   a. One standard double-pedestal desk
   b. Padded vinyl chair
   c. Two casual chairs
   d. Three-tiered desk tray
   e. Waste basket
   f. Four-drawer file cabinet, locking
   g. Portable dictation device (such as a Norelco 85)
   h. Small utility table, 18"x 24"
   i. Pencil sharpener
   j. Calculator or adding machine (printing)
   k. Typewriter

3. Secretary's office (100 sq. ft.)

   a. One standard double-pedestal desk
   b. Secretarial postural chair
   c. Three-tiered desk tray
   d. Waste basket
   e. Calculator or adding machine (printing)
   f. Typewriter
   g. Two four-drawer file cabinets, locking
   h. Small typewriter table if the desk is not equipped to house a typewriter
   i. Dictation equipment or transcriber to be used with the portable equipment supplied the director and principal
   j. Four casual chairs, stacking type
   k. Two staplers, heavy duty and standard

4. Conference room (600 sq. ft.)

   This room should be equipped to meet the specific needs of the guidance department. Such as may be needed from time to time to meet its multiple use can be transferred into it without undue difficulty.

5. Storage room (100 sq. ft.)

   A storage room is recommended for the guidance area and there appears no reason why this space could not be shared between the two. It would be necessary to place a divider within this to maintain separation of function and perhaps enlarge it slightly to provide for its dual role.

   Closets should be provided in each room. These should be equipped with shelving and two or three drawers.

D. Thermal environment

Provision should be made to maintain a temperature range between 65 and 85 degrees Fahrenheit and since this is intended for use during the summer months, air conditioning will be required as well as suitable ventilation. The ceiling should be treated with acoustical plaster or a textured tile, the selection should be on the basis of that which is installed in the remainder of the area. While it will not be necessary to provide complete sould barriers between offices, they should be designed to allow a reasonable degree of privacy. It is recommended that the floors be carpeted as a continuation of the acoustical treatment.

E. Visual environment

Illumination should be provided at approxiamtely 75 foot candles on the working surface for all areas. If natural light is used, windows should be placed so that a minimum of glare is presented and drapes or shades should be provided for light control. Colors generally should be cool and pleasing to the eye, design should be simple and interms of the function of the area. The atmosphere should create an initial impression that will be attractive to the faculty members who will be in consultation with the administrative personnel.

F. Utilities

Electrical outlets should be provided every six or eight feet around the walls. Telephone extensions should be provided in all three offices. An inter-communication console should be provided or an extension from the central office should be available here. Although it might prove more expensive, consideration might be given to the possibility of installing a separate console for the vocational-technical area that can be made a part of the central system.

G. Special Requirements

The director's and principal's offices should be equipped with counter space on which material may be displayed for examination by a small group. This should be at least six feet long and beneath it should be provided additional storage. This should be enclosed and sliding doors should be provided. The top should be surfaced with formica or equivalent.

If the administrator is to effectively meet his obligations to the student body and faculty, he must be equipped with a facility which will reflect these obligations and aid him in the pursuit of his responsibilities. Unquestionably, the role of the teacher and administrator is changing and we assume for the better. However, failure to recognize the administrator's role in the development of an educational philosophy and the translation of this philosophy into the instructional process is to fail to recognize the administrator as the person responsible for evaluating and adjusting the relationships within the educational enterprise so that the program of instruction in a given area is developed to fulfill the expectations of the students, faculty and community. The physical environment in which he spends his working hours will have an important influence on his ability to fulfill these expectations.

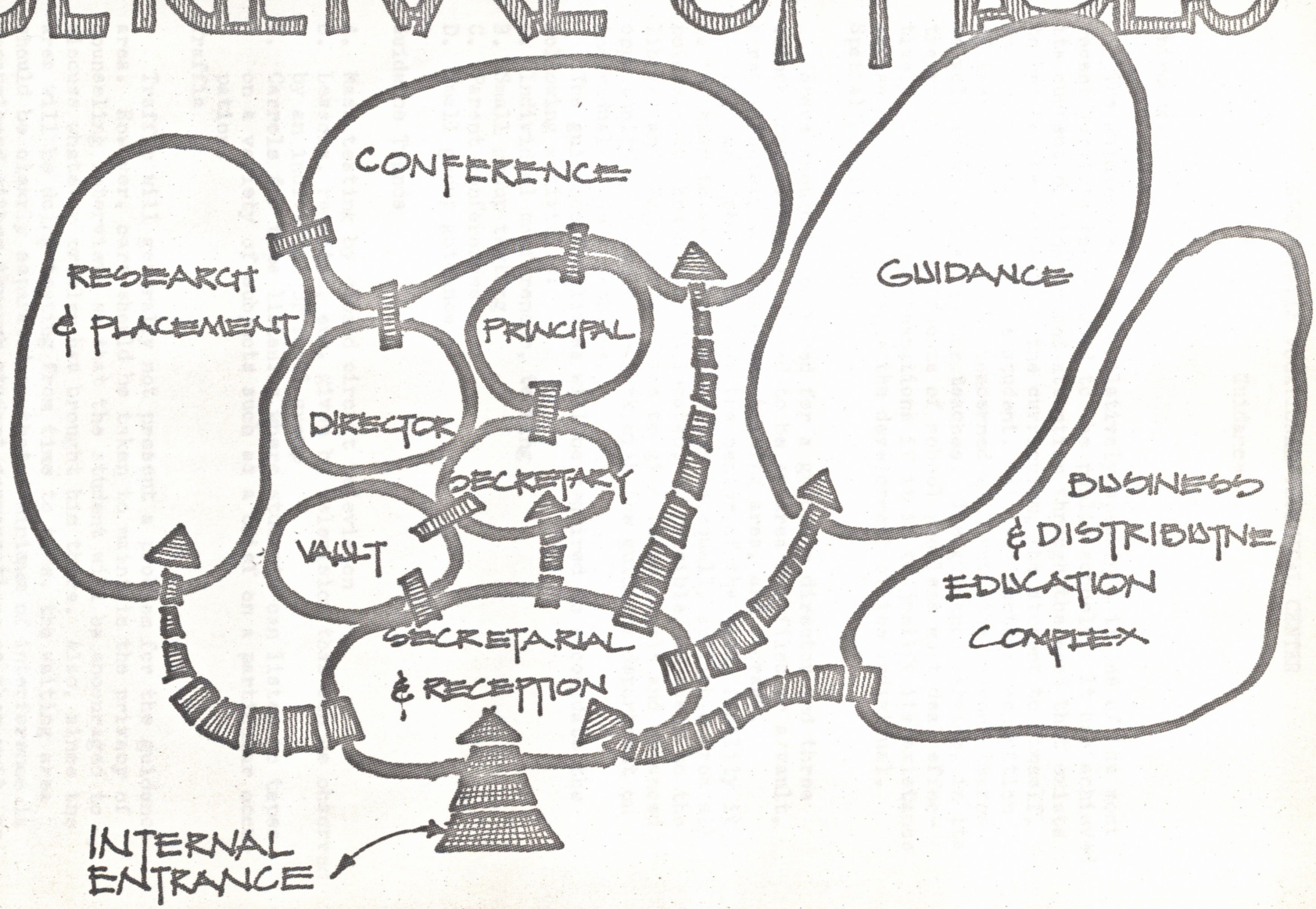
GREAT FALLS VOCATIONAL-TECHNICAL CENTER

Occupational Research and Placement Center

The application of the most advanced methods of instructing post high school and adult students in technical occupation skills requires that the investment of money, time, and effort of the student, school, and community be commensurately rewarded with appropriate employment of the graduated student. The technology required for adequate training of students in technical occupations should be equaled by the technology of placement. Whether such placement would be at job entry level or specialist level would depend largely upon the student's previous experience, his degree of success in the training course, and the job openings available.

The space requirements for this operation are almost entirely dependent upon the methods and systems of record keeping and data analysis. If microfilm records are kept and availability of a computer is involved, which I will assume, the space requirements would be no greater than a 12' x 16' room or approximately 200 sq. ft.

GENERAL OFFICES



GREAT FALLS VOCATIONAL-TECHNICAL CENTER

Guidance

I. Introduction

The guidance service, relatively speaking, is one of the most recent services to be added to the public schools. It has achieved its current prominance and attention through the need that exists to relate the student to the curriculum, the student to himself, and the curriculum to the student. It is a further recognition of the growing need to be concerned with what the learner learns as well as what the teacher teaches. The guidance service, in its treatment of the many facets of school problems must deal effectively with these manifestations if it is to justify its existance and successfully influence the development of the individual.

II. Spatial relationships

Space should be provided for a guidance director and three counselors. There will need to be an area for files or a vault, a receptionist, waiting area, testing area, and storage.

This area should be near the center of the total facility it is intended to serve so that access is equally available from all points. It shouls also be located, if possible, adjacent to the library and registrar's office to give these people and enhanced opportunity to consult and work with the guidance department on individual student problems.

The guidance facilities will be required to accomodate the following activities:

A. Individual conferences, testing
B. Small group testing
C. Parent conferences
D. Small group guidance

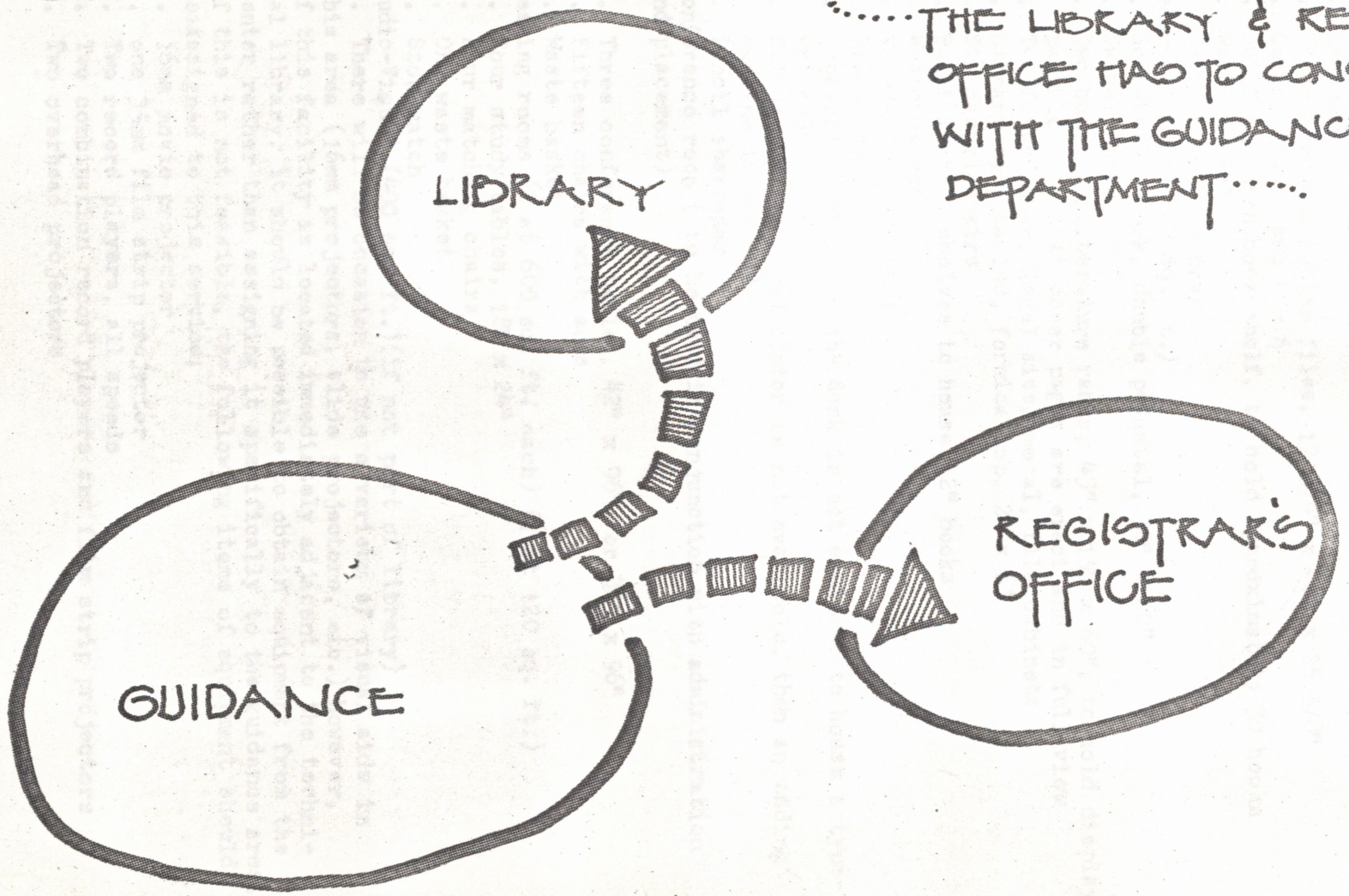
III. Guidance Trends

A. Mass testing by closed circuit television
B. Lessons, remedial, etc. given by television that can be observed by an individual or small group
C. Carrels for tape listening where students can listen to tapes on a variety of subjects such as a brief on a particular occupation.

IV. Traffic

Traffic will generally not present a problem for the guidance area. However, care should be taken to maintain the privacy of counseling interviews so that the student will be encouraged to discuss whatever problem has brought him there. Also, since the area will be doing testing from time to time, the waiting area should be clearly separated so that a minimum of interference is encountered either through student conversations as they wait, or their movement to or from other parts of the building..

GUIDANCE



"..... THE LIBRARY & REGISTRAR'S OFFICE HAS TO CONSULT WITH THE GUIDANCE DEPARTMENT....."

V. Furniture and Equipment

A. Counseling offices (3 each at 120 sq. ft.)

1. Teachers desk, couble pedestal, 30" x 60"
2. Swivel chair
3. Multi-purpose table, 18" x 24" x 30", and chair for student use
4. Armchair
5. Three card and letter files, 17 3/4" x 40" x 26 5/8"
6. Cards, 3 x 5, and 4 x 6
7. Built-in, open book shelf, to hold approximately 30 books
8. Waste basket
9. Three-tier desk tray

B. Reception room (300 sq. ft.)

1. Secretary's desk, double pedestal, 30" x 60"
2. Swivel chair
3. Two built-in literature racks, 43" x 15" x 60", to hold display pamphlets so that cover pages are erect and in full view
4. Two four-drawer, legal size, metal, file cabinets
5. Library-type tables, formica top, 2' x 6'
6. Six casual chairs
7. Built-in book shelves to house 12" books
8. Waste basket
9. Three-tier desk tray
10. Typewriter
11. Typewriter table (if the desk is not equipped to house a typewriter)
12. Calculator (if a calculator is not available, then an adding machine is needed)
13. Pencil sharpener

C. Conference room (to be used in conjunction with administration and placement)

1. Three conference tables, 42" x 96", or 36" x 96"
2. Fifteen chairs with arms
3. Waste basket

D. Testing rooms (2 at 600 sq. ft. each) (1 at 120 sq. ft.)

1. Four study tables, 18" x 24"
2. Four matching chairs
3. One waste basket
4. Stop watch

E. Audio-Visual (400 sq. ft.)(if not part of library)

1. There will be occasion to use a variety of visual aids in this area (16mm projectors, slide projectors, etc.) however, if this facility is located immediately adjacent to the technical library, it should be possible to obtain equipment from the center rather than assigning it specifically to the guidance area. If this is not feasible, the following items of equipment should beassigned to this service:

a. 16mm movie projector
b. one 35mm film strip projector
c. Two record players, all speeds
d. Two combination record players and film strip projectors
e. Two overhead projectors

In addition to this, several tack boards and display areas should be provided within the facility. Tack boards should also be provided in the main hallway. A 3' x 4' bulletin board should be provided in each counseling office and a 4' x 8' bulletin board in the reception room and in each conference room also. A television outlet should be provided in each conference room with a built-in screen for use with other audio-visual equipment.

F. Vault (100 sq. ft.)

VI. Thermal Environment

A. Provision should be made to maintain a temperature range between 65 and 85 degrees F. Since this facility is to be used during the summer, air conditioning would be a necessity. Ventilation will also be required of the area.

B. Acoustical treatment

Carpeting should be provided in all parts of this area and acoustical tile or plaster should be used on the ceiling. It is desirable that noise levels be maintained at minimum levels to aid in the relaxation and comfort of the individuals who would be utilizing this area, sometimes under considerable stress. Acoustical treatment will measurably increase the effectiveness of the personnel assigned to this service.

VII. Visual Environment

A. Illumination

One large window should be provided for each counseling office for natural light. At least one window should be provided in the waiting area. In each instance, provision should be made for light control. Either blackout curtains or drapes of some kind. Generally, light intensity should be maintained at 75 foot candles at working levels.

B. Colors and textures

The atmosphere should generally be light and attractive but not garish. It should be simple, modern, and cheerful. Wood paneling might be considered in the counseling offices. The impression the individual receives upon entering this area will have an important influence on the effectiveness of the people working here. Therefore, every effort should be made to create a relaxing atmosphere. The colors should be cool, the designs simple and functional.

VIII. Utilities

It is recommended that electrical outlets be provided every 6 or 8 feet of wall space. A telephone extension through the central office should be provided. A public address system should be extended between the reception room and the central office. Closed circuit television should be extended to this area so that mass testing could be carried on through its use. Provision should be made for a tape deck extension through the central office so that music can be played continually in this area.

IX. Storage

A storage room of approximately 8' x 8' is desirable for this area for storing standardized tests, paper, etc. It should have as much shelving as possible, a counter top and several drawers.

X. Special Requirements

If a vault is not provided for the guidance area, fire-proof file cabinets should be purchased so that records can be protected. Since this type of cabinet is quite heavy for certain types of floors, provision should be made to locate these in a reinforced spot.

GREAT FALLS VOCATIONAL-TECHNICAL CENTER
Teacher Offices

I. Introduction

Typically, a vocational-technical instructional institution incurs a relationship between teacher and student that is vastly different from the relationship that exists between those parties in a public school system. The reasons for this difference are many. The adult status of the vocational-technical student and the problem solving approach to many of the technical skills training courses are among those reasons.

The modes of instruction also require a closer personal relationship between instructor and student, first for the development and evaluation of marketable skills, and secondly for the development of the spirit of team work that is so necessary for the student to possess if he is to realize more than monetary satisfaction ffom his occupational specialty.

The design of the facilities should reflect those needs, in that private or semi-private office space should be established for instructors where they may counsel with their students, their fellow teachers, and instructional supervisors or co-workers.

II. Office Traffic

A. The separation of the instructor's office spaces from the classroom is necessary if privacy is to be provided, in that different class groups may occupy the same classroom space during succeeding time periods.

B. The office for a particular instructor should be situated reasonably close to both the classroom and the technical library so that materials of reference are readily available to and from both teaching-learning areas.

C. Teachers, students, and staff members may occupy individual office spaces for brief periods of time. The offices should be located so that traffice in and out will not cause classroom disturbance or create conflicts with other instruction.

III. Space Relationships

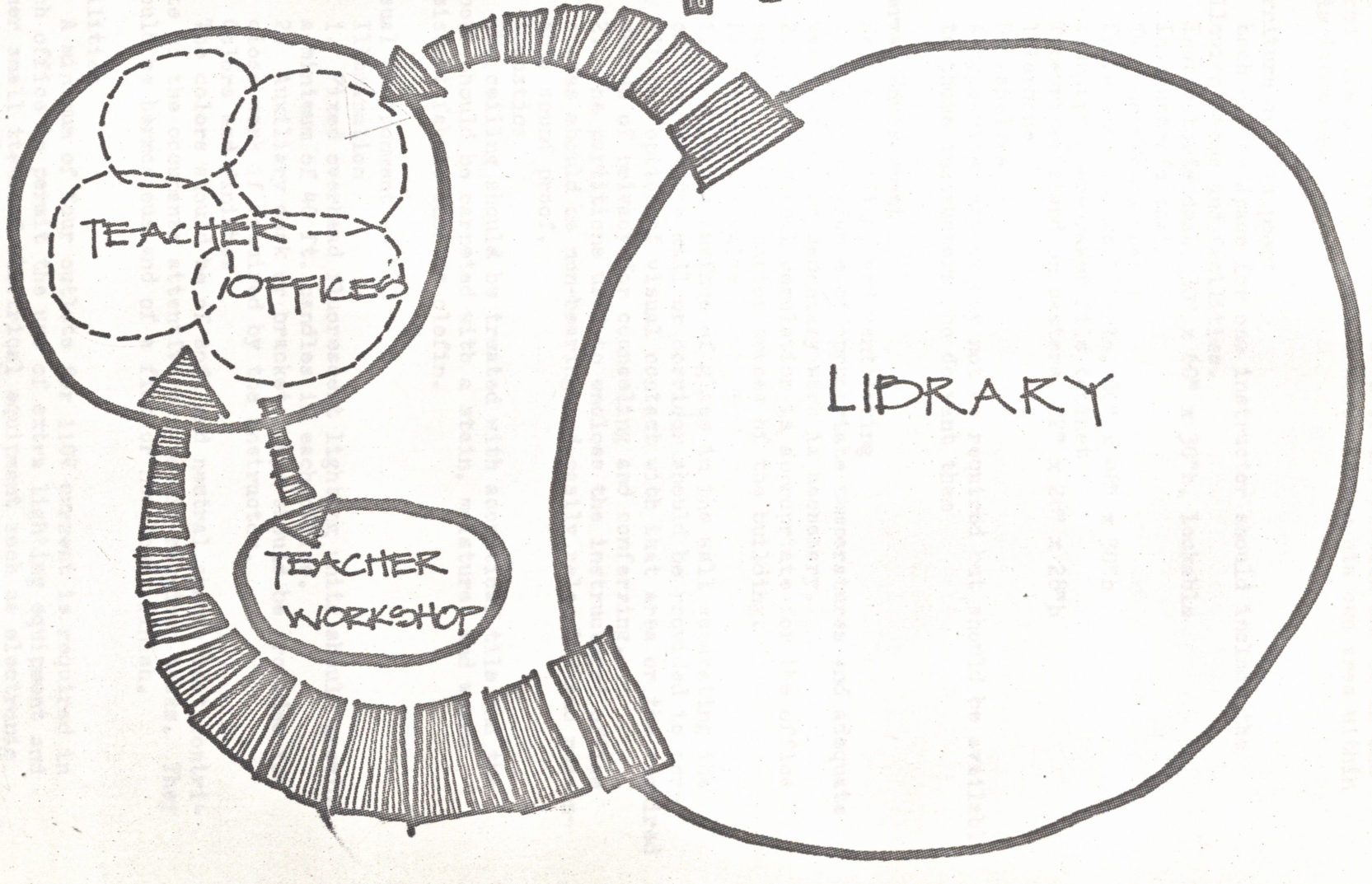
A. Because the technical library is requested and recommended to be centrally located, the most appropriate spatial location of the instructors offices that are to be separated from the classroom and laboratory areas is around the outside perimeter. of the technical library.

B.. The distribution of offices should relate directly to the number of instructors required by the nearest instructional complex or wing.

C. A minimum of 120 sq. ft. should be provided for each instructor to permit him to accomplish the variety of activities which include the following.

1. Course and lesson preparation
2. Fellow teacher conferences on unit and course work
3. Counseling and tutoring of students
4. Counseling with supervisors and guidance personnel
5. Conferring with specialists and resource people

TEACHER OFFICES



This could be accomplished with the instructor offices grouped together according to their area of instruction and be in one large type office with each teacher having his own area within this large room.

IV. Furniture and Equipment

Each office space for one instructor should include the following items and facilities.

1. Instructor's desk, 30" x 60" x 30"h, lockable
2. Instructor's chair
3. Two conference chairs
4. Conference and work table, 30" x 48" x 30"h
5. Standard four-drawer file cabinet
6. Typewriter stand on casters, 22" x 28" x 28"h
7. Telephone
8. Bookshelves
9. A typewriter may or may not be required but should be available to those instructors who do want them

V. Thermal Environment

A. Heating, cooling, and ventilating

1. The maintenance of appropriate temperatures and adequate ventilation for sedentary work is necessary.
2. Fixed thermal regulation is appropriate for the office spaces in the interior spaces of the building.

B. Partitions and walls

1. A suitable surface of glass in the wall separating the office from the mall or corridor should be provided to permit the option of visual contact with that area or the required degree of privacy for counseling and conferring.
2. The partitions used to enclose the instructors' office spaces should be non-bearing and easily relocated and reasonably sound proof.

C. Acoustics

The ceiling should be treated with acoustical tile and the floors should be carpeted with a stain, moisture, and wear-resistant fabric such as olefin.

VI. Visual Environment

A. Illumination

1. Fixed overhead fluorescent lighting units should provide a minimum of 40 ft. candles in each office.
2. Auxiliary desk or bracket lamps should be provided for close work if required by the instructor.

B. Colors and finishes

The colors should be of soft and neutral shades that contribute to the occupants attentiveness to his required tasks. They should be harmonious and of a flat or nonglossy finish.

VII. Utilities

A minimum of four outlets for 110V current is required in each office to permit the use of extra lighting equipment and other small items of electrical equipment such as electronic graders, tracing tables, adding machines, etc.

VIII. Special Structural Requirements

A workroom near each group of classrooms and laboratory spaces and separate from the technical library should be provided for the instructors to permit them to accomplish special lesson materials preparation.

The Workroom (150 sq. ft.)

The workroom should be equipped with the following items.

1. Storage cabinets for paper stock and reproduction materials
2. Two spirit duplicators
3. One photo process duplicator capable of developing transparencies and making duplicator masters
4. Countertop sink, double tub, for cleansing of hands and equipment
5. Four work tables, 48" x 48" x 30"h
6. Sixteen tubular steel stacking type chairs
7. Acoustical treatment of both ceiling and floor
8. Outlet service for 110V electricity at 6 foot intervals at table level along two walls of the workroom.

GREAT FALLS VOCATIONAL-TECHNICAL CENTER
Classroom Complex

I. Introduction

Although the characteristics of some of the vocational-technical courses are such that a classroom must be incorporated in the instructional complex, others involve such a distinct division of classroom treatment of laws and principles from shop or laboratory practices that it is most advisable to provide a complex of classrooms apart from the laboratory spaces. The correlation of laboratory time to classroom instruction time varies between courses by ratios of 2 to 1 and 4 to 1. The economy of space in relation to time utilized reinforces the separated location of classroom space from the shop areas by reason of financial expediency.

II. Traffic

A. Personnel

Both students and teachers will be moving to and from the classroom spaces as the mode of instruction varies between laboratory and classroom instruction.

The sizes of the student class groups will vary from time to time according to the instructional technique and the subject matter being considered. Consequently the need for divisible space arises.

Access should be provided for instructional and student personnel into each of the six subdivisible areas.

B. Materials

The traffic of materials will for the most part consist of nothing larger than audiovisual devices and some small models or mock-ups. The largest items will be the tables and other furniture required for effective classroom instruction.

III. Space Relationship

A. External

The classroom complex should be in close relationship to the offices of the instructors who will be using these spaces for theory and principles teaching. The classroom complex should also be closely related to the laboratory complexes and the technical library.

B. Internal (4500 sq. ft.)

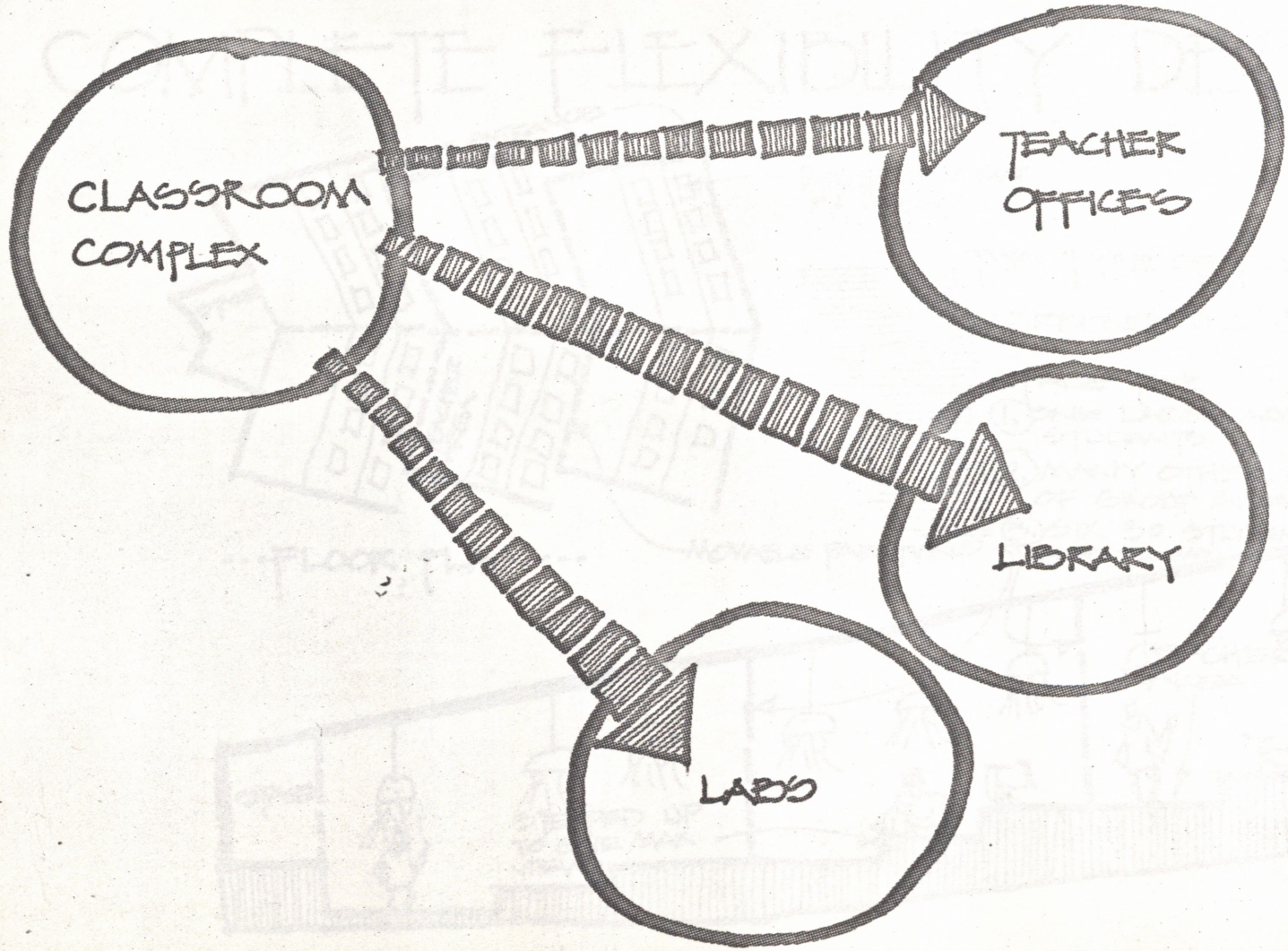
The open construction of the complex should be such that it can seat two large groups of ninety students or less and be further subdivisible into six classroom spaces appropriate for class sizes of 25 to 30 students.

The total area of the classroom complex should be 4500 sq. ft. to meet the time and space requirements for the classes that will be conducted in these spaces rather than in the laboratory or shop complex.

IV. Furniture and Equipment

Each of the six divisible class spaces should be equipped with the following items.

CLASSROOMS



CLASSROOMS

COMPLETE FLEXIBILITY DESIRED

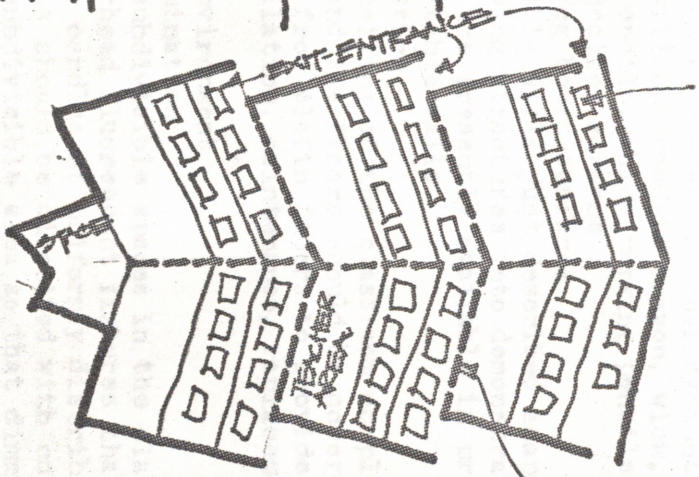


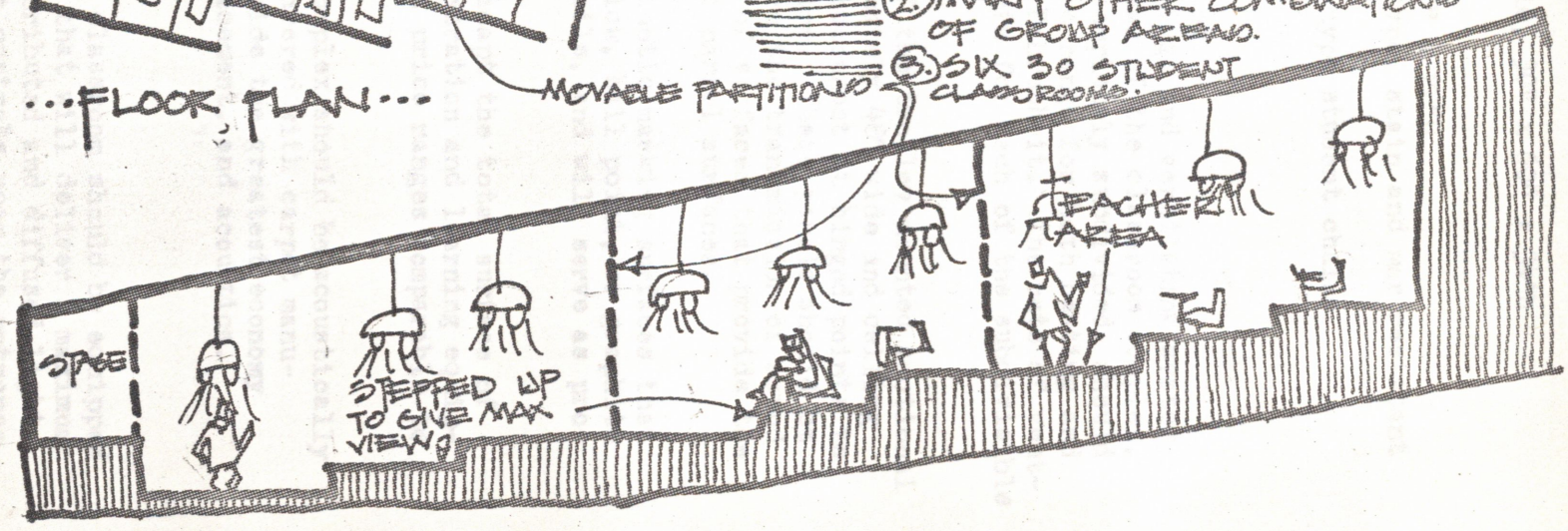
TABLE OR BUILT IN DESKS.

THIS TYPE OF FLEXIBILITY WARRENTS THE USE OF THE SPACE FOR

1. ONE LARGE AUDITORIUM FOR 180 STUDENTS.
2. MANY OTHER COMBINATIONS OF GROUP AREAS.
3. SIX 30 STUDENT CLASSROOMS.

MOVABLE PARTITIONS

...FLOOR PLAN...



....SECTION....

1. Instructor's demonstration table, 30" x 60" x 34"h
2. Instructor's chair
3. Chalk board panel, 4' x 8'
4. Steel storage cabinet, 18" x 48" x 72"h
5. Eight tubular steel, stacking type, stain and mar resistant work tables, 30" x 96" x 30"h
6. Thirty tubular steel, stacking type student chairs
7. Chart racks

V. Thermal Environment

A. Heating, cooling, and ventilating

A ceiling mounted heating, cooling, and ventilating system that will uniformly service all areas of the classroom complex, whether it is completely open, or completely subdivided, should be provided with a fixed temperature range for both heating and cooling, between 72 and 75 degrees Fahrenheit. The rate of ventilation should be maintained at 40cfm for each of the subdivisible spaces.

B. Dividing Structures

The portable walls should be of the trolley mounted sectional panel variety, with panels approximately 48" wide and ceiling high that will latch together or disconnect at hinged points to permit partial or complete separation. These panels should be constructed of materials that reduce the transmission of sound and be finished with a combination of surfaces that provide the following alternatives on different parrel surfaces.

1. Vinyl plastic tack surfaces
2. Non-porous stain proof synthetic marking surfaces that will accommodate crayon, wick, ball point, or graphite pencils, china marking pencils, and will serve as projection screens
3. Peg board surfaces

The portable walls just described adapt the total surface of the dividing structures into demonstration and learning equipment and are presently available in price ranges comparable to other portable walls.

C. Acoustics

The ceiling of the classroom complex should be acoustically treated and the floors should be covered with carpet manufactured from olefin fibers to provide the greatest economy of installation, maintenance, replacement, and acoustics.

VI. Visual Environment

A. Illumination

All subdivisible spaces in the classroom should be equipped with overhead fluorescent fixtures that will deliver a maximum of 50 ft. candles of uniformly distributed and diffused light. The lights should be circuited with controls near the entrance of each subdivisible area so that dimming may be accomplished to permit the use of audiovisual equipment.

B. Colors and Textures

The colors in each of the subdivisible spaces should either correspond or harmonize with the colors in each of the other class size spaces so that an atmosphere conducive to learning is maintained throughout the complex.

The colors of the ceiling, walls, carpeting, and furniture should harmonize, and the reflective capacities should correspond to the following requirements.

1. Ceiling 80% minimum; flat or non-glossy texture
2. Side walls and moveable walls (exclusive of marking board surfaces) minimum of 50%, non-glossy texture
3. Furniture tops, maximum of 35 %, non-glossy synthetic
4. Cappeting, maximum of 20%

VII. Utilities

Electricity should be provided at six feet intervals by baseboard outlet clusters along the outer walls of the large open area to permit maximum application of as many electrical and electronic instructional devices as may be applicable to the highly specialized kinds of instruction taking place in this center.

VIII. Special Considerations

The installation of closed circuit television that may be connected to a regional, area, or unit center is highly recommended for this classroom complex.

GREAT FALLS VOCATIONAL-TECHNICAL COMPLEX
Multi-media Center

I. Introduction

The vocational-technical student will be attending school anywhere between the hours of 8:00 a.m. to 12:00 midnight. Many students will be employed full or part-time and therefore can be expected to be in the vocational-technical building at variable times. This will result in the need for study space between sessions or while waiting for class where technical journals and other learning materials are available to the student. The technical library therefore will serve as a center for library and other instructional materials and provide a place for individual study and preparation.

The American Association of School Librarians believes that the school library, in addition to doing its vital work of individual reading guidance and development of the school curriculum, should serve the school as a center for instructional materials. Instructional materials include books, other printed materials, films, recordings, and newer media developed to aid learning.

A. Spatial relationships

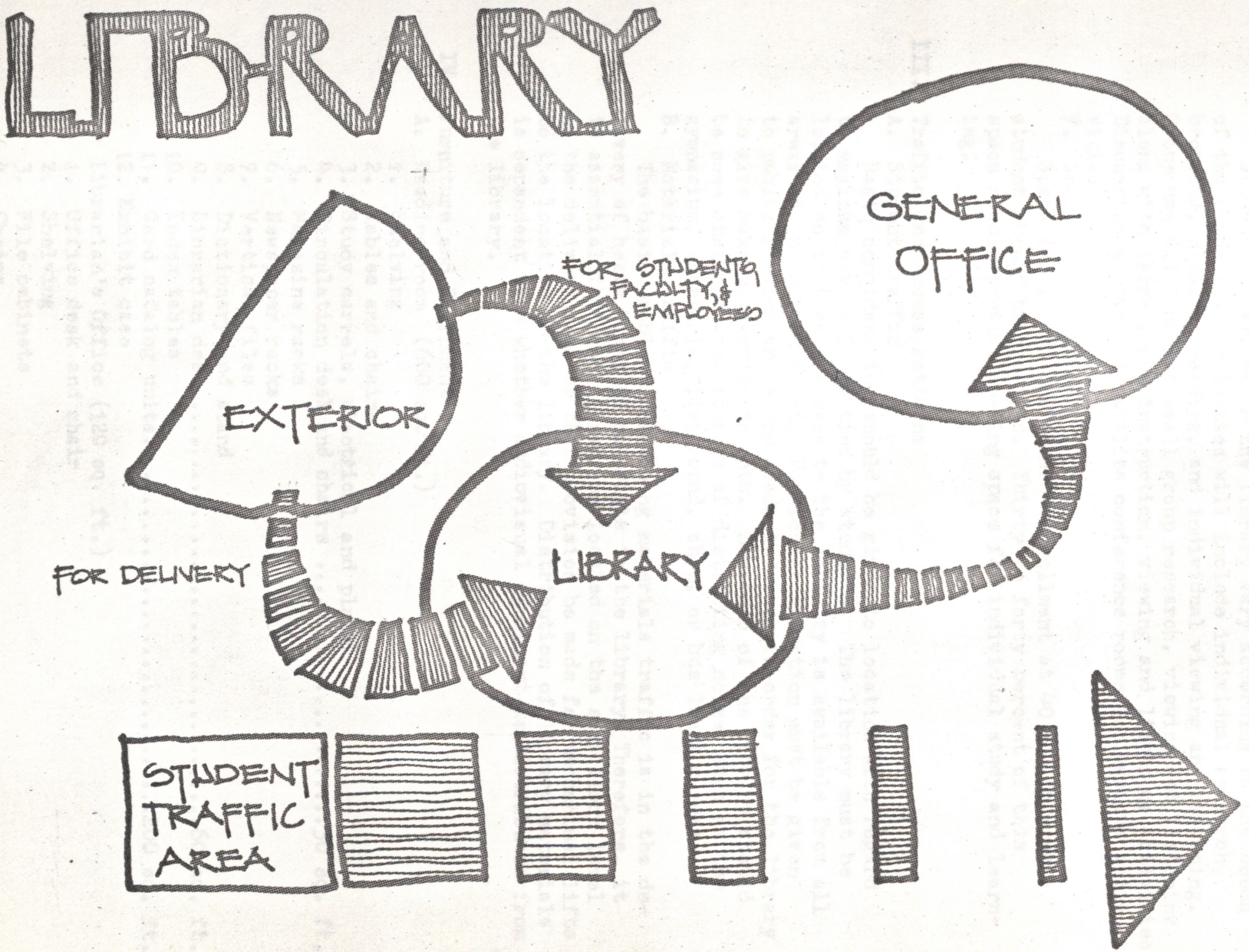
The technical library should be located so that students will have easy external access to the facility. It should be as close as possible to the delivery and distribution area in the school buildings. This will facilitate minimum handling of books and audiovisual deliveries and give maximum efficiency to distribution of materials, particularly audiovisual machines and other equipment. The library should be located in conjunction with all public service areas of the school such as the general offices area, delivery, and major student traffic areas. Facilities for serving approximately 225 students in study activities requires approximately 9,000 sq. ft. of space.

B. Educational Outcomes

Today's library program must contribute something more to the overall education of youth then materials and services geared to curriculum needs. The scope of knowledge has become too vast to be covered extensively in classroom instruction, superior though that instruction may be. A student's interest, appreciations, and educational needs will be extended immeasurably in all areas of knowledge if a well-planned library with more than adequate materials and well-trained staff are provided as an essential part of the school program.

C. Discernible trends

The school library is becoming the center of educational resources necessary for self-instruction, curriculum amplification, research, evaluation, and as a supportive area to teaching and learning throughout the school plant. Current trends indicate improvement in the education of youth emphasizes the importance of a full complement of library resources, personnel, services, and facilities. With expanded and intensified programs in an area of the curriculum and new methods of instruction, more varied demands are made upon library services. A variety of audiovisual materials and an abundance of printed materials has placed pressure upon libraries in schools to meet the vast scope of knowledge in today's world.


LIBRARY
GENERAL OFFICE
FOR STUDENTS, FACULTY, & EMPLOYEES
EXTERIOR
FOR DELIVERY
LIBRARY
STUDENT TRAFFIC AREA

D. Student planning areas

Conference rooms and the library classroom will provide space for small group and large group usage. Speech groups, previewing of materials, and group assignments are basic uses of these areas.

E. Student Activities

Student activities in the library vary according to the needs of the students. Activities will include individual research, browsing, pleasure reading, and individual viewing and listening. Group use will involve small group research, viewing and listening along with large group instruction, viewing and listening activities. Discussion groups will utilize conference rooms for various activities.

F. Space requirements

Space for 15% of the student enrollment at 40 sq. ft. per student should be provided. Thirty to forty percent of this space should provide seating space for individual study and learning.

III. Traffic and Access Patterns

A. Student traffic

Basic consideration should be given to location with regard to maximum use of facilities by students. The library must be located so that easy access to the facility is available from all areas of the school plant. Particular attention must be given to public service areas and academic areas in order for the library to give maximum service to both. Location of the library should be some distance from sources of distracting noises such as the gymnasium, cafeteria, playground, shop, or bus loading area.

B. Materials traffic

The basic problems concerning materials traffic is in the delivery of heavy boxes of materials to the library, Therefore, it is essential that the library be located on the same floor level as the delivery area or that provision be made for mechanical lifts to the location of the library. Distribution of library materials is dependent upon whether audiovisual equipment is distributed from the library.

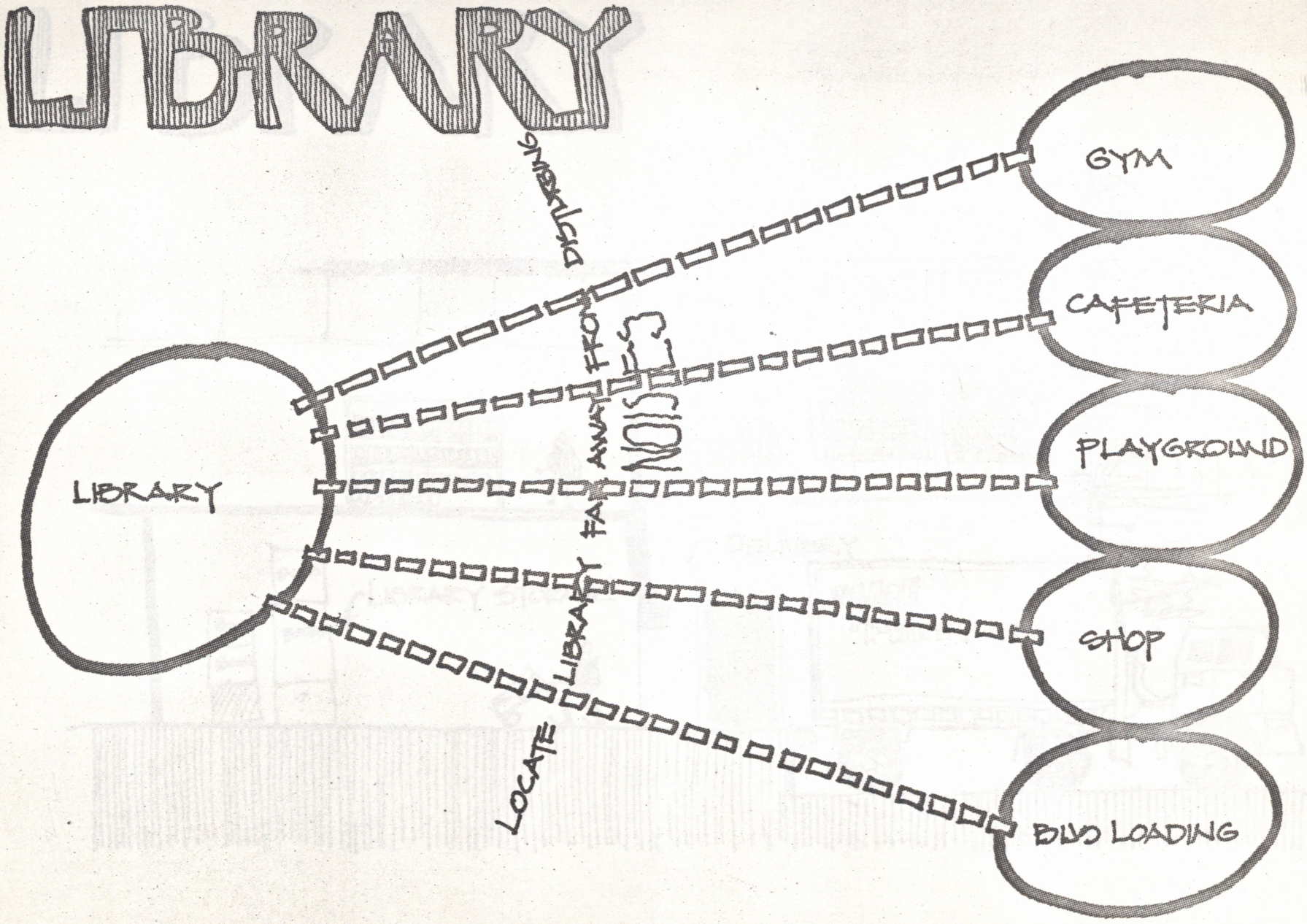
IV. Furniture and Equipment

A. Reading room (600 sq. ft.)

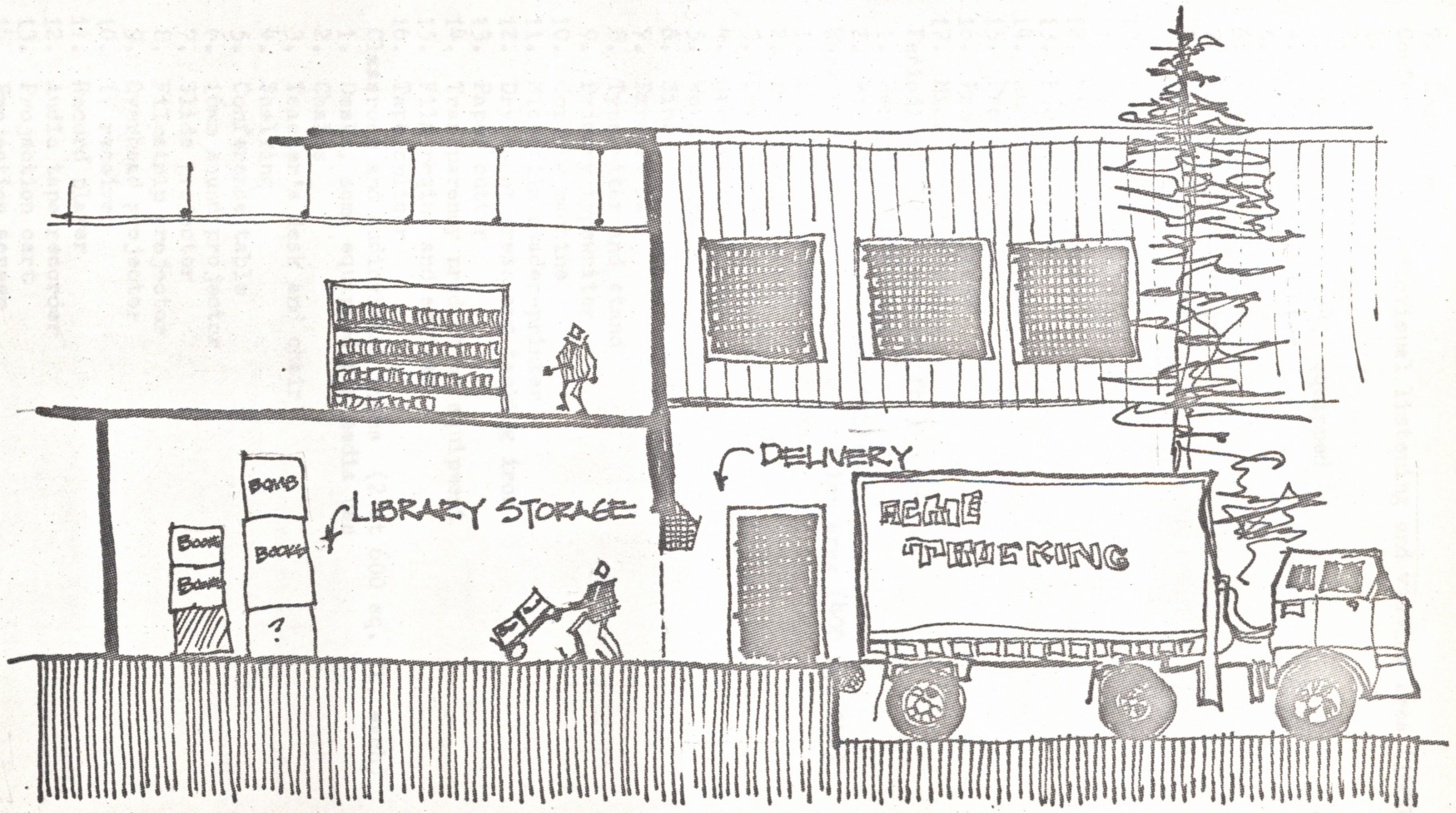
1. Shelving
2. Tables and chairs
3. Study carrels, electrical and plain
4. Circulation desk and chairs .....50 sq. ft.
5. Magazine racks
6. Newspaper racks
7. Vertical files
8. Dictionary and stand
9. Librarian desk.....60 sq. ft.
10. Index tables
11. Card catalog units.....200 sq. ft.
12. Exhibit case

B. Librarian's Office (120 sq. ft.)

1. Office desk and chair
2. Shelving
3. File cabinets
4. Chairs
5. Typewriters
6. Adding machine


LIBRARY
DISTURBING
GYM
CAFETERIA
AWAY FROM
NOISE
PLAYGROUND
LIBRARY
FAR
LIBRARY
SHOP
LOCATE
BUS LOADING

LIBRARY



7. Desk lamp

C. Conference and audiovisual listening and viewing area (1600 sq. ft.)
   1. Shelving
   2. Tables and chairs
   3. Study carrels, media equipped
   4. 16mm sound projector
   5. 8mm projector
   6. slice projector
   7. Filmstrip projector
   8. Overhead projector
   9. Opaque projector
   10. Filmstrip viewer
   11. TV receiver
   12. Micro projector
   13. Record player
   14. Audio tape recorders
   15. Projection cart
   16. Projection screen
   17. Micro-print readers

D. Periodicals room (600 sq. ft.)
   1. Periodical shelving
   2. Micro-print reader and tables

E. Work room and audiovisual production area (400 sq. ft.)
   1. Built-in cabinets and sinks
   2. Desks and chairs
   3. Counter height stools
   4. Special shelving
   5. Work tables
   6. Sink
   7. Exhaust fan
   8. Typewriter and stand
   9. Primary typewriter
   10. Copying machine
   11. Microfilm reader-printer
   12. Dry mount press and tacking iron
   13. Paper cutter
   14. Transparency production equipment
   15. Film reqind and splicer
   16. Tape splicer

F. Classroom and audiovisual rooms (2 at 600 sq. ft. each)
   1. Desks, some equipped for media use
   2. Chairs
   3. Teacher's desk and chair
   4. Shelving
   5. Conference table
   6. 16mm sound projector
   7. Slide projector
   8. Filmstrip projector
   9. Overhead projector
   10. TV receiver
   11. Record player
   12. Audio tape recorder
   13. Projection cart
   14. Projection screen

The above listed furniture and equipment are basic to the average library requirements according to the 1967 American Library Association Standards. They are not all inclusive. Additional requirements will be indicated by individual school needs when plans for a school building are in their final stages.

G. Other equipment
   1. Circulation or charging desk .....200 sq. ft.
   2. Card catalog cabinets.....200 sq. ft.
   3. Book trucks
   4. Legal size file cabinets
   5. Dictionary stands
   6. Atlas stands
   7. Large picture files
   8. Typewriters
   9. Office desks
   10. Chairs
   11. Wall glass exhibit case
   12. Informal furniture

H. Teachers' Office and Workroom (400 sq. ft.)

Library quarters must include sufficient work space for the technical processing and repair of materials, for conducting business routines, and for storing supplies and equipment. Work rooms should include adequate work space, a counter with vinyl or formica top and work sink, with various types of storage drawers and cupboards above and below the counter. Standard facilities for ventilation, heat, and lightling are essential. The work room should open into the main library room. For supervision reasons glass panels between the work room and the library should be provided. A separate storage room with special shelving and storage compartments should be adjacent to the work room. The storage closet may be used for audiovisual equipment storage and should be designed to be of sufficient size for both library and audiovisual needs.

I. Storage
   1. Built-in facilities (1200 sq. ft.)

The library work room and classroom areas will need extensive built-in facilities. These should be designed prior to finalization of building plans. Built-ins will primarily be used for storage of library processing and circulation supplies, audiovisual supplies and equipment, and special library materials such as large charts, maps, globes, exhibit models, etc.

   2. Storage requirements

Storage space is necessary for supplies and audiovisual equipment. One large room with specially designed storage unit will suffice for both needs. A cloak closet for staff use should be provided in the work room or office area.

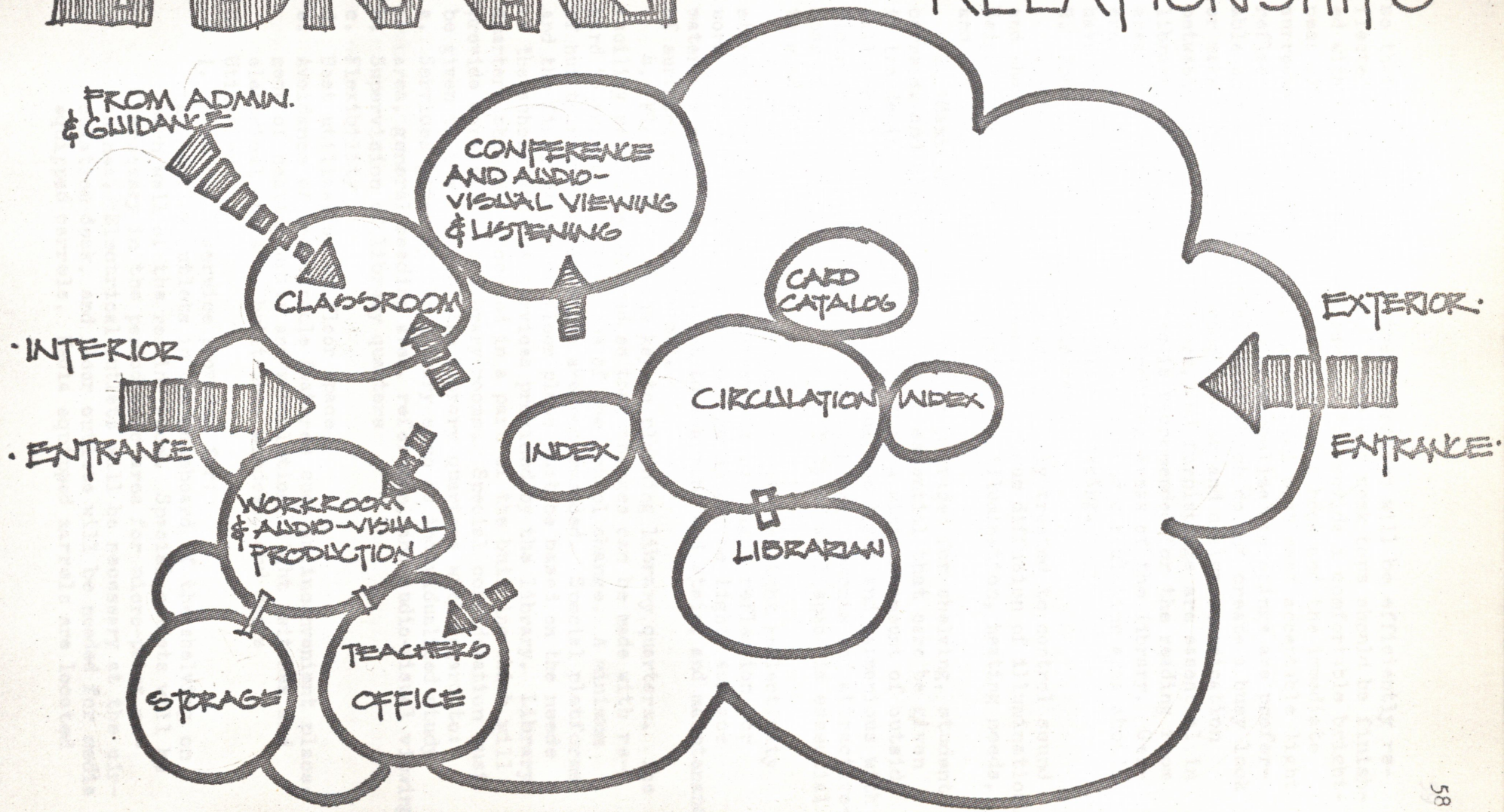
J. Reading area and stacks (6080 sq. ft.)

V. Special Requirements

A. Visual environment

The color of the ceilings, walls, floors, tables, and desk tops all contribute to the redistribution of light around the room and the attractiveness of the general visual environment. Ceilings and walls should be light in color and of a non-glossy finish

LIBRARY INTERNAL RELATIONSHIPS



so that light received on these surfaces will be efficiently reflected back into the room. Table and desk tops should be finished with a light diffusing surface to provide a comfortable brightness ratio between the white pages of a book and the immediate surroundings. Floor covering material must meet acceptable light reflecting standards. Plain or marbelized coverings are preferable unless patterns are selected which do not create a busy look or make the room look crowded. Color and design coordination between ceiling, walls, floors, and furnishings are essential in library planning. Carpeting is recommended for the reading room area, conference rooms, and browsing areas of the library. General traffic area at entrance and around circulation area should have vinyl tile or linoleum floor covering.

B. Special structural requirements

1. Ceilings should be acoustically treated to control sound and should be light in color for maximum diffusion of illumination. Height level should be determined by illumination, heating needs, and shelving requirements.

2. Maximum wall space must be provided for shelving, student carre;s. and display areas. It is essential that care be given in the design of window space so that a minimum amount of outside wall area is used. Wall color whould be light and harmonious with floor and ceiling to meet illumination requirements and attractiveness of total environment. Flexibility of wall space is essential to good library usage.

3. Work surfaces should meet acceptable light reflectivity standards. Recommended requirements for light reflection for work surfaces is 40 percent. Colors should be light, surface materials should be resistant to scarring and stain, and maintenance of surfaces should be minimal.

4. Flexibility is the key to planning library quarters. The facility should be planned so that changes can be made with regard to arrangement as needs of the school change. A minimum of built-ins or static walls are recommended. Special platforms and the final design of floor plans must be based on the needs of the school and the services provided by the library. Library quarters should be located in a part of the building which will provide more spacious library rooms. Special consideration must be given to the shape of the library quarters with regard to:

a. Services given by the library such as individualized study area, general reading area, reference, and audio-visual viewing, etc.
b. Supervision of library quarters
c. Flexibility
d. Best utilization of floor space
e. Avoidance of undesirable features such as inconveniant placement of heating units and ventilation, light switches and electrical outlets, built-ins, windows, and doors

C. Utilities

1. Electrical service provides for:
   a. Duplex outlets in the baseboard of the shelving on each wall of the reading room. Special outlets will be necessary in the periodicals area for micro-print machines. Electrical outlets will be necessary at the circulation desk, and floor outlets will be needed for media equipped carrels. Media equipped carrels are located

adjacent to classroom and conference room walls; wall outlets will be needed. Duplex outlets are necessary above the work counters in the work room and in the office.

b. A telephone outlet in the office area
c. Exhaust fan in work room and storage room
d. Intercommunication outlet in the general library area and classroom

Light switches, electrical outlets, thermostats, telephone, and fire extinguishers should be located where they will not use space needed for shelving.

D. Audio-visual

Placement and type of display areas must meet viewing requirements of the library. Special display cases add to library effectiveness and general atmosphere. Various sizes of bulletin boards are necessary for displays, instruction, and viewing. Most display areas are located near the entrance and circulation desk sections of the library. Movable display screens create flexibility whereas attached bulletin boards should be minimal in order that wall space be left free for shelving or other library equipment. If audio-visual services are contained in the library or conference design for audio-visual use, special consideration should be given to viewing screens, chalk boards, sound outlets, TV outlets, and display boards similar to those installed in a regular classroom.

E. Acoustical

General sound resistant wall, floor, and ceiling materials are essential in order to maintain a minimum noise level in all areas of the library. Special sound proofing will be necessary in conference rooms used for group discussions, class instruction, and audio-visual viewing and listening. Special sound proofing of general library reading and reference areas will depend on placement of library in the overall school layout. Office space will require special sound proofing in order to eliminate noise transmission to the general library areas.

F. Illumination

Recommended minimum illumination level for libraries is 70' candles to avoid direct glare from the light sources, fixtures must be selected that have a low brightness surface. Maximum attention should be given to the type of lighting fixtures, placement of lights, and reflection factors which concern ceilings, walls, furniture, table and desk tops, floors, windows, and door trim. The Illuminating Engineering Society recommends fluorescent or mercury lighting in various styles according to height of ceilings.

Lighting will involve both natural and artificial illumination. The illumination level should not fall below 70' candles even when natural light is at a very low level.

G. Thermal environment

The ventilating, heating, and cooling systems must provide optimum conditions for the preservation of library materials and the comfort of the library occupants. Recommended temperature control should range from 72 to 76 degrees. Humidity requirements vary greatly depending on location in the school building and geographical location of the city. In general, heating and cooling systems should be located so that placement of book stacks and

material storage will not be affected by high temperature change. Wall heating units with fan installation are the least desirable systems in libraries. Floor or ceiling heating units are the most desirable.

H. Intercommunications systems

Communication systems which are designed for general school needs are sufficient for the library. Many school libraries are finding that piped-in music is creating an atmosphere conducive to study, decreases noise level, supervision problems, and reduces study fatigue in students. The American Library Association is now recommending the provision for such an atmosphere in reading rooms of libraries. Many intercommunication systems have FM radio facilities as a part of the system which means little, if any, added cost to the overall school system. A telephone installation is advisable in the library office.

GREAT FALLS VOCATIONAL-TECHNICAL SCHOOL
Business Education and Distributive Education

I. Introduction

A. Curriculum content

The content of the courses in this curriculum is organized to train persons of both sexes to occupationally proficient levels so that a minimum of personal adjustment from the classroom environment to the business world environment is required.

It is the intene of this course of training to begin training, retrain, and extend training of past high school students accepted for enrollment. In keeping with these intentions, the following levels of instruction of course work is indicated.

1. Beginning courses and optimum class sizes
   a. Typing, 25 pupils
   b. Shorthand I, 20 pupils
   c. Record keeping, 25 pupils
   d. Business mathematics, 25 pupils
   e. Sales and merchandising
   f. Accounting I
   g. File clerk
   h. Office clerk
   i. Telephone and switchboard
2. Intermediate courses
   a. Typing, 20 pupils
   b. Shorthand II
   c. Office practices, 20 pupils
   d. Records administration
   e. Office machines, 20 pupils
   f. Business law, 25 pupils
   g. Accounting II
3. Advanced courses
   a. Data processing and key punch operation
   b. Advanced shorthand III
   c. Shorthand machines (posting, stemography, etc.)
   d. Management and administration
   e. Office practices, transcribing and duplicating machines
   f. Advanced business machines (posting and billing)
4. Related training will include the following:
   a. Accounting machines
   b. Duplicating machines
   c. Verifier
   d. Collator
   e. Introduction to advertising and businees psychology

B. Spatial relationships

1. The distributive education complex consists of the following spaces:
   a. Classroom
   b. Student storage
   c. Merchandising and storage
2. The business education complex (also serves the distributive education functions) includes the following spaces:
   a. Beginning typing
   b. Advanced typing

c. Shorthand I, II, and III
d. Office practices
e. Office and advanced business machines
f. Business law, management, and administration
g. Secretarial services center
h. Instructors' center

II. Traffic

A. Access

Treatment of access points should be treated from the consideration that day and night usage of this complex will occur.

1. Exterior access should be provided at several points.
   a. From the circulation area which passes the distributive education student store
   b. To the receiving door of the distributive education store room
   c. From the grounds and parking spaces
2. Interior access should be such that the department's secretarial services center becomes the operational hub of the complex. All class spaces are accessible from this area.

B. Internal Traffic

1. The secretarial center will minimize the requirements for corridors and hallways within the complex.
2. The classroom traffic should follow the pattern identified below:
   a. Move from entrance to clothing storage unit
   b. Move from clothing storage unit to learning area and project storage unit
   c. Move from project storage unit to work and study stations
   d. Interim movement may occur from work station to materials and supplies storage or to cleanup and grooming station
   e. Excess traffic: From work station to project storage
   f. From project storage to clothing storage
   g. From clothing storage to exit

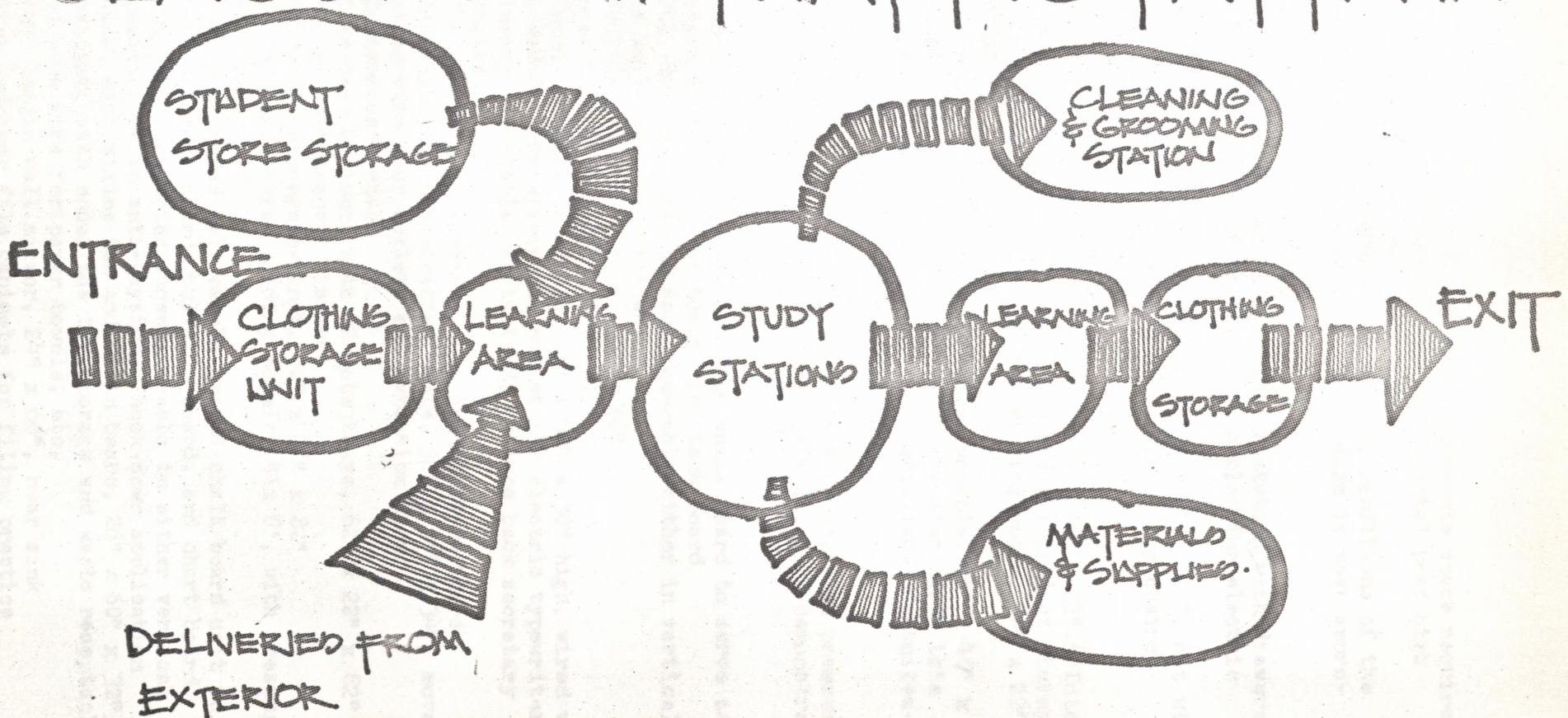
   Space must be provided for grouping around the two initial and final storage units. A six-foot aisle is recommended.

C. Materials Traffic

1. The receipt of heavy and bulky materials shipments, particularly those for distrubutive education, will be accomplished at the overhead deliveries door in the exterior wall of the storage and merchandising space.
2. The distribution of small quantities of paper and duplicating stock to both the business education complex and the distributive education classroom will require no more aisle space than is necessary for personnel traffic.
3. The doorway and aisles between the distributive education storage and merchandising room and the student store should allow for the movement of large items. An operating width of six feet is required.

BLIND ED. & DIST. ED.

CLASSROOM TRAFFIC PATTERN



III. Furniture and Equipment

The listed furniture and equipment represents space requirements for handling approximately 1/8 of the total post high school enrollment of this technical center.

To most closely approximate the working conditions of the business world, the open space function desigh is most appropriate.

A. Typing I zone (450 sq. ft.)

1. Seven typing desks, double "L" , 2 station with drawers, 46" x 32" x 28", wired with 110v outlet for electric typewriters
2. Seven typing desks, double arm, 46" x 32" x 28", not wired
3. Adjustable, ventilated, posture back typing chairs
4. Fourteen electric typewriters
5. Fourteen manual typewriters
6. Tote tray cabinet, with 72 tote trays, 62" x 22". Tote trays, 12" x 18" x 4½" deep, for student project storage
7. Materials storage cabinet with sliding doors, 48" x 22" x 82"
8. Instructor's demonstration table, movable, 30" x 48" x 34", wired with four 110v outlets and extension cord; this table to serve as mechanical and audiovisual demonstration base
9. Instructor's chair
10. Chalk board, three sliding panels 4' x 6', with pressure retainers to stablize boards while writing or demonstrating
11. Sink and mirror
12. Vinyl textured wall surrounding chalk board to serve as chart board, bulletin board, and tack board
13. Pull-down projector screen, operable either in vertical or anti-keystone position
14. Full length wall mirror, 24" x 66"

B. Advanced typing zone (750 sq. ft.)

1. Twenty secretarial desks, 36" x 60" x 30" high, wired with a double 110v electrical outlet for electric typewriter
2. Twenty adjustable, ventialted, posture back secretary chairs
3. Ten electirc typewriters, ten manual typewriters
4. Instructor's demonstration table, 30" x 16" x 34", movable, wired with four outlets and extension cord
5. Instructor's chair
6. Tote tray cabinet, with 72 tote trays, 62" x 22" x 82" for student project storage
7. Materials storage cabinet, 48" x 22" x 82"
8. Chalk board, three sliding panels, 4'x 6', with pressure retainer units
9. Fabric textured wall panels around chalk board unit to serve as tack board, bulletin board, and chart board
10. Pull down projector screen, usable in either vertical position or in anti-keystone, hook-down application
11. Sink, with mixing tap and drain board, 26" x 60" x 32" cabinet, with under the top storage and waste receptacle of mesh wire for paper towels, etc.
12. Full length wall mirror, 24" x 66", near sink
13. Five 4-drawer file cabinets for filing practice

C. Business law, management, and administration (960 sq. ft.)
1. Twenty student tables, 30" x 48" x 30", wired with one 110v outlet for dictation machine
2. Twenty desk chairs
3. Five 2-station wireless dictation receiving units
4. Unabridged dictionary
5. Ten typewriters, manual
6. Five adding machines
7. Instructor's demonstration table, 30" x 60" x 30", wired with four outlets and extension cord
8. Instructor's chair
9. Chalk board, four sliding panels, 4' x 6'
10. Vinyl or fabric textured wall usrface around chalk board unit on the front wall
11. Tote tray cabinet, with 28 tote trays, 22" x 22" x 82"
12. Materials storage cabinet, 48" x 22" x 82"
13. Wall stack book shelving, 10" deep x 36" wide x 5" high
14. Projector screen, anti-keystone mounted
15. Wireless, 4 channel, tape broadcasting console unit
16. Full length mirror, 24" x 66"
17. This area can double as typing instruction space by providing extra typewriters to the zone.

D. Advanced business machines, bookkeeping, posting, billing, key punch, and computer programming .....(850 sq. ft.)

The grouping of equipment is from the more simple to the most complex and allows for the motality rate as course work requires greater skill and more complicated procedures and understanding.

1. Three printing calculators
2. Four work tables, 3' x 6' x 30", wired with three outlers per side and extension cord
3. Two bookkeeping machines, posting and billing
4. Two key punch consoles, card and tape
5. One computer, similar to 1620_2
6. Chalk board, six sliding panels, 4' x 6', pressure retained
7. Textured, vinyl, cork, or fabric wall surface along front wall
8. Tote tray cabinet, with 28 tote trays, 22" x 22" x 82"
9. Full length wall mirror, 24" x 76"
10. Materials supply cabinet, 48" x 22" x 82"
11. Instructor's movable table, 30" x 60" x30"
12. Instructor's chair
13. Eight adjustable, ventilated, postûre back chairs
14. Fifteen fold away, tablet arm, stacking type chairs
15. Four 4-drawer file cabinets for practical training
16. Book shelf stack for text and manual storage, 12" wide shelves, five shelves high, three feet long and 60" high

E. Office machines (450 sq. ft.)

Provision for the storage of some machines in this zone will permit this psace to be used for personal records and bookkeeping instruction.

1. Four work tables, 36" x 8' x 29"
2. Twenty-four adjustable, ventilated, posture back chairs
3. Eight 10-key adding machines
4. Eight full key adding machines
5. Two rotary calculators
6. Two printing calculators
7. Four key driven calculators

8. Instructor's demonstration table, 30" x 60" x32", wired with four outlets
9. Instructor's chair
10. Chalk boards, six sliding panels, 4' x 6'
11. Anti-keystone mounted projector screen
12. Two tote trays storage cabinets, with 24 trays per cabinet, 22" x 22" x 82"
13. Six 4-drawer file cabinets
14. Two wall stack units for work form books, for record keeping, formal bookkeeping courses and text materials
15. Machines storage room, with 125 linear feet of shelving, 18" wide for storing machines and typewriters not in use
16. Two portable machine carts, 24" x 60", on 6" rubber tired casters
17. Six 4-drawer legal size file cabinets for practical training

F. Advanced shorthand and office practices (750 sq. ft.)

The instructional function of this zone will include both manual and mechanical methods of transposing dictations into shorthand records and transcribing from that record form to typing.

1. Twelve double armed typing desks equipped with a four channel wireless receiver unit two head phone sets and two 110v outlets per arm
2. Ten electric typewriters, ten manual typewriters
3. Twenty-four adjustable, ventilated, posture back desk chairs
4. Ten shorthand machines
5. Tote tray cabinet, with 72 tote trays, 62" x 22" x 82"
6. Two materials storage cabinets, 48" x 22" x 82", lockable
7. Chalk boards, four sliding panels, 4' x 6'
8. Instructor's table, 30" x 48" x 30"
9. Instructor's wireless transmitting cabinet with four tape units for transmitting dictation at four different speeds of four different contents on four different channels to meet individual student's abilities and learning rates. The students at each double desk should be reasonably matched to work on the same material at the same speed. Each transmitting cabinet should have storage space for the following:
   a. Twelve small receiver units
   b. Drawer for twenty-four tapes of dictated materials
   c. Twenty-four head sets for receiving dictated materials
10. Wall mounted counter top cabinet, with under the top storage and wall mounted overhead cabinets with adjustable shelving for dictation tape library
11. Two photo-process duplicators
12. One spirits duplicator
13. Two direct process ink transfer duplicators
14. Counter top sink, double tub
15. Full length wall mirror, 24" x 76"
16. Teletrainer unit for telephone training
17. Paper cutter, 24", hand operated

G. Beginning shorthand (550 sq. ft.)

1. Eleven double arm typing desks, wired for two 110v outlets per arm and one small wireless receiver unit with two headset jacks and drawers

2. Eleven electric typewriters
3. Twenty-two adjustable, ventilated, posture back desk chairs
4. One large work table, 36" x 8' x 30"
5. Chalk boards, six sliding panels, 4' x 6', with pressure retaining mounts
6. Textured walls surrounding chalk board unit for bulletins, tack work, and chart display
7. Tote tray cabinet, 62" x 22" x 82", with 72 tote trays
8. Materials storage cabinet, 48" x 22" x82"
9. Instructor's table
10. Instructor's chair
11. Instructor's wireless transmitting cabinet with four tape units for transmitting dictation at four different speeds of four different contents on four different channels to meet individual students' abilities and learning rates. The students at each double desk should be reasonably matched to work on the same material at the same speed.

    Each transmitting cabinet should have storage space for the following:

    a. Twelve small receiver units.
    b. Drawer for 24 tapes of dictated materials
    c. Twenty-four head sets for receiving dictated materials

IV. Distributive Education

The overlapping of business education and distributive education will require that some of the learning processes take place in the business education class spaces. It is, therefore, necessary that the unit be in direct contact with the business education unit.

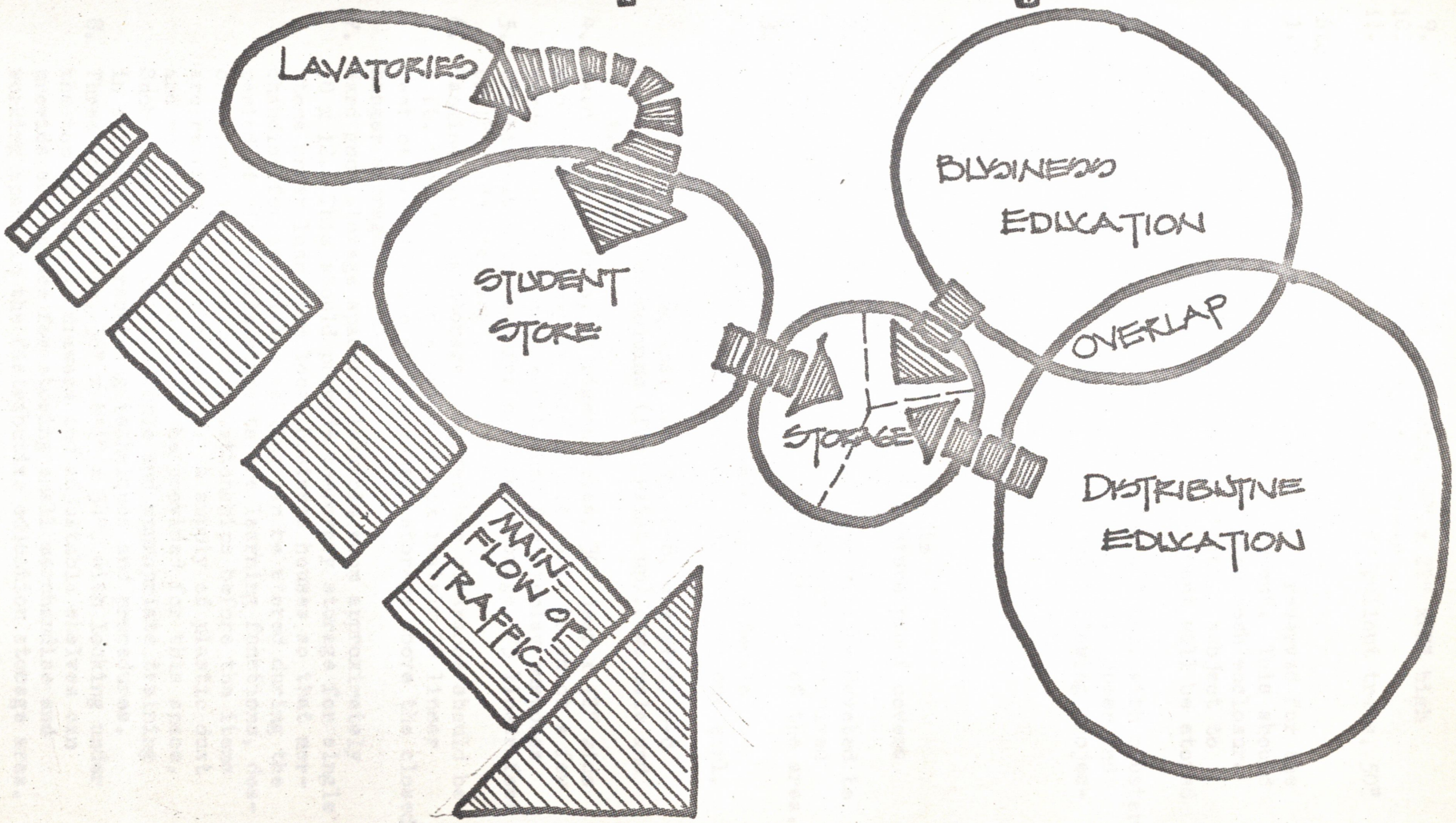
Distributive education should be closely related to graphic arts facilities and utilize the communication concepts of that field of technology.

The student store should be located at a position bordering the main flow of student traffic within the technical center to afford as much practical direct contact with a shopping and buying public as possible while in the classroom and class practice situation.

Students may be employed on a part-time basis by local business establishments and may also spend a corresponding period of time in classes.

A. Classroom furniture and equipment (750 sq. ft.)
    1. Twenty trapezoid topped tables, parallel sides, 24" and 30", 24" wide for flexible group or individual work arrangements
    2. Twenty stacking type posture backed chairs
    3. Instructor's display table, 40" x 7'1" x 30", with outlets for 110v current at 2 ft. intervals along teacher's side of the table and under the top storage in both drawers and shelves
    4. Instructor's chair
    5. Chalk board, 5 sliding panels, 4' x 6'
    6. Textured wall board on the wall housing the chalk board unit
    7. Tote tray cabinet with 72 tote trays, 62" x 22" x 82" high, for the student project storage
    8. One counter with storage underneath, 12' long, 4' side, 36-38" high

BUS. ED. & DIST. ED.



9. Two materials storage cabinets, 48" x 22" x82" high
10. Anti-keystone mounted projector screen
11. Fabrics swatch storage cabinet with 12 pullout trays, 50" x 27" x 82"

B. Storage (600 sq. ft.)

1. A portion of this storage space will be reserved for the business education materials and equipment. This should be an expanded metal or heavy gauge wire mesh enclosure that can be securely locked yet constantly subject to visual inventory. The following equipment will be stored in this space:
   a. Eight projector tables with 26" x 40" top, with cluster or four 110v outlets and extension cord. Upper and lower shelves will store any of the following projectors
   b. Two 8mm sound film projectors
   c. Two 16mm sound film projectors
   d. Three overhead projectors
   e. Two opaque projectors
   f. Three video tape-TV receiver units
   g. Appropriate plastic dust and moisture proof covers for the equipment
2. The major portion of the storage space will be devoted to distributive education materials which can be acquired from merchants, wholesalers, and manufacturers of the area.
3. Mannequin storage for the following:
   a. Two adult mannequins, one male and one female
   b. Two junior mannequins; one boy, age 12-14, one girl, age 12-14
   c. Two child mannequins; one boy, 6-8, one girl, 6-8
   d. Four torso mannequins (from waist up), two male and two female
4. Hard goods storage, 12 pigeon holes, 30" deep x 12" wide x 6" high, for dummy styrofoam bolt casts to which a few yards of material can be attached for display purposes
5. Clothing item storage for cartoned storage, 75 linear feet of 18" wide shelving
6. Hanging clothing storage: hanger bar clearance should be 5 ft. from floor and provide approximately 20 linear feet of hanger space with overhead storage above the closed hanger storage
7. Hard good storage space: a lockable room approximately 10 x 12. This should provide temporary storage for single items under loan from local business houses so that merchandise for associated selling can be stored during the period of time while students are learning functions, description, qualities, and relationships before the items are returned to the supplier. A supply of plastic dust and moisture shields should be provided for this space. Such operations provice ample and appropriate training in shipping and receiving techniques and procedures.
8. Three work benches, 36" x 8'1" x 34", with locking under the top storage in drawers and adjustable shelves can provide some space for storing small merchandise and working space in the distributive education storage area.

These benches should be provided with the following:

a. Racks for rolls of heavy wrapping paper with tear bar for reshipment packing procedures
b. String spools
c. Wrapping tape rack
d. Staple gun

E. Merchandising zone (100 sq. ft.)

This space provides for training in merchandise preparation, display techniques, and arrangement training. It will require the following equipment:

1. Sales service table, 36" x 6'1" x 32"
2. Cash register
3. Closed glass display case on wheels for sales clerk service training

F. Display area (50 sq. ft.)

A flow through display cabinet classes from corridor section with doors opening into classroom, size 6' x 6' x 5', with electrical lighting and carpeted floor

G. Student store (1080 sq. ft.)

The display and sale of real merchandise that meets the needs of the student population of the technical center is the educational objective of this training space. The equipment should meet the requirements of the commodities and merchandise for sale.

1. Soft goods counter, 2 closed glass cases for displaying items priced of toiletries, paper stock, stationery, drafting tools, art supplies, etc. Each case 36" wide x 46" high x 6' long with adjustable shelving and internal lighting.
2. Book shelves, capable of displaying technical text materials for course work taught in the technical center, 30 linear feet
3. Magazine display racks, 4 tiered, 5 feet long
4. Confection and notions and cigarette counter, 3' wide x 46' high x 6' long
5. One six-drawer recording cash register
6. Two large covered waste receptacles
7. Back counter cabinet, with sliding doors for shelved storage
8. Open wall shelving for display storage
9. Order counter for students to order art, drafting, and trade tools
10. Lavatories and rest rooms should be available in, or very close to, this production area

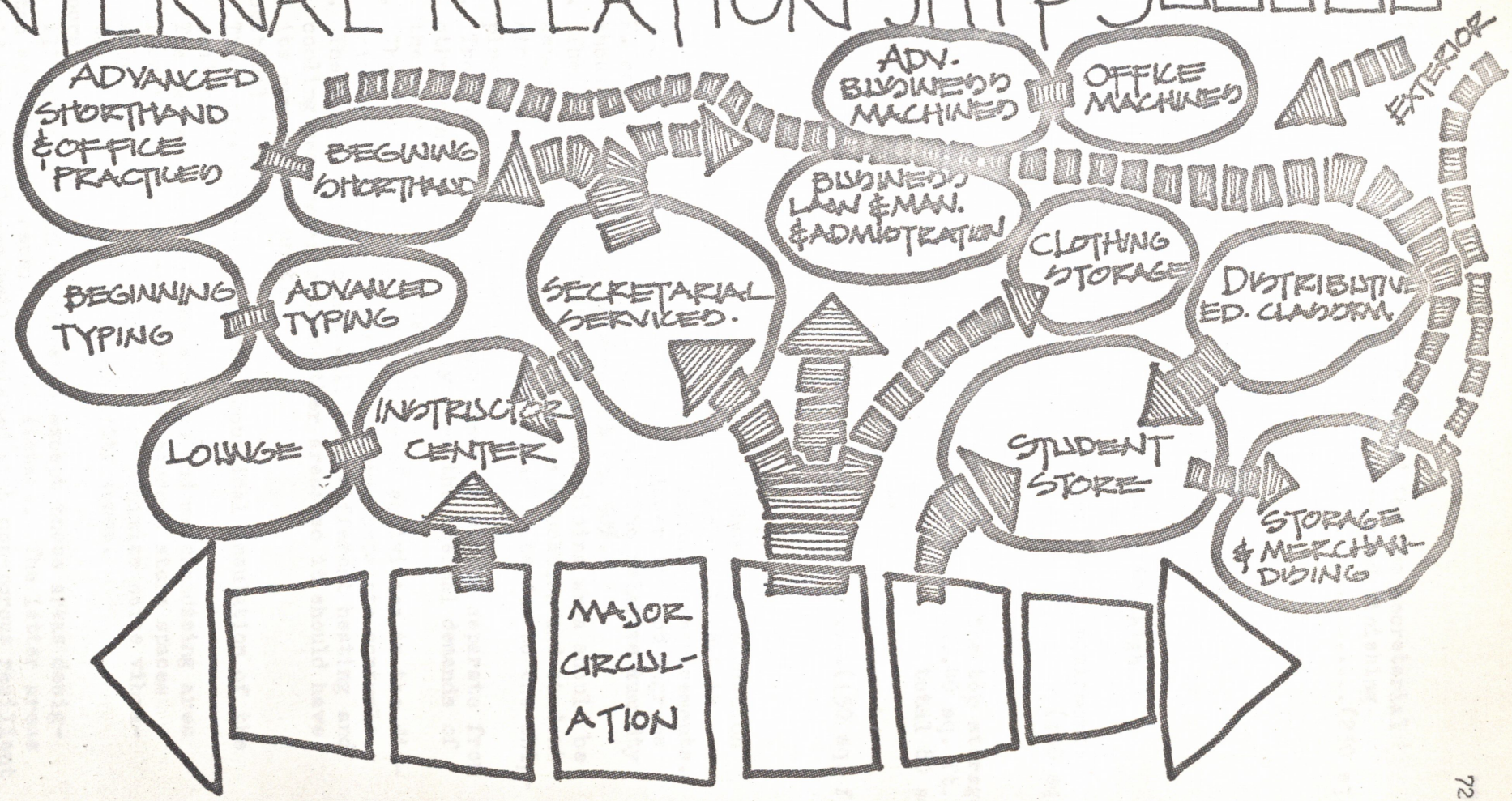
H. Instructors center and secretarial service

The following equipment is necessary for each of the eight instructors' offices: .....960 sq. ft.

1. Instructor's desk
2. Instructor's chair
3. Conference chair
4. File cabinet, 4 drawer
5. Clothing closet
6. Extension telephone
7. Book shelves, 4 shelves high, 4 feet long, 10 inch wide shelves

BUS. ED. & DIST. ED.

INTERNAL RELATIONSHIPS



The following equipment is required for the secretarial service. This facility is considered very good finishing practice for secretarial trainees. .....(250 sq. ft.)

1. Two secretarial desks
2. Two secretarial chairs
3. Two electric typewriters
4. Samll work table, 36" x 40" x 30" high
5. Two conference chairs
6. Two department telephones
7. Two dictating machines
8. One supply cabinet, 36" wide x 18" deep x 60" high
9. Duplicating machine

The instructors' lounge requires the following equipment: (150 sq. ft.)

1. Upholstered sofa
2. Three upholstered chairs
3. Counter top cabinet with small sink and under the top storage
4. Two rest room facilities, male and female .....40 sq. ft. each total 80 sq. ft.
5. Magazine rack for professionl journals
6. Two small magazine tables

The Instructors' workroom .....(150 sq. ft.)

IV. Thermal Environment

A. Heating, air conditioning, and humidity controls

1. The large open space afforded by the business education complex lends itself to a single control unit that is responsive to heating, cooling, and humidity requirements. The temperature range whould be no lower that 68 degrees F. and no higher than 74 degrees F. The relative humidty should be maintained between 30% and 50%.
2. The controls in the storage merchandising area should be separate from those in the business education and student store because of the different demand rate due to the shipping and receiving door.
3. The controls in the student store should be separate from other controls to adequately meet the thermal demands of the activities in that area.
4. The closer quarters and variety of activities in the distributive education classroom require separate controls.
5. The instructors' lounge will have different heating and cooling requirements than other areas so it should have its own central unit.

B. Acoustical treatment

1. The entire complex requires acoustical insulation of the ceilings.
2. The walls separating the storage and merchandising area from the business education and student store spaces should be internally insulated to minimize noise vibrations from reaching those activity zones.

C. Floors

All spaces should be carpeted except those areas designated as shipping, receiving, and storage. The latter areas should have the floors well finished with non-porous resilient

synthetic resin applications of a quality similar to torginal.

V. Visual Environment

A. Illumination

1. Natural illumination is desirable but must be controlled by appropriate amounts and location of the glass.
   a. The bottom will of the window should not be below 4 ft. to prevent external visual and auditory distraction.
   b. The eave overhang of windows should be of sufficient width to minimize solar heating in spring, summer and fall.
2. Artificial illumination
   a. Overhead fluorescent lighting in the business education complex should provide 50 ft. candles of light uniformly from the center of the space to the walls for adequate equal lighting of night classes.
   b. All windows should be draped to allow audio-visual instruction.
   c. The banks of fluorescent lights should be so circuited as to allow reduced artificial lighting near the windows and increase lighting near the center of the area.
   d. Light control switches should be installed in each class zone to meet the lighting and dimming requirements of that space according to natural light available or audio-visual instructional requirements.
   e. The storage and merchandising zone requires only 30 Ft. candles of illumination in that close or fine work will not be occurring in this space.
   f. The display window of the merchandising zone will require numerous incandescent and fluorescent fixtures to provide variable substage, overhead, side wall, back drop, and spot lighting effects on displays.
   g. The student store requires overhead fluorescent lighting at 40 ft. candles intensity, plus various display case internal lighting and some adjustable overhead spots to highlight certain mercahndise features.
   h. The distributive education classroom requires 50 ft. candles maximum illumination for close work on fabrics and other merchandise elements.

B. Dividing structures:

1. All walls should be of temporary construction where they are architecturally permissible.
2. Flexible walls, between class spaces, should be track mounted in both the ceiling and the floor to provide stability. These folding walls are required to provide both lighting and noise elimination for the use of audio-visual instruction in one class zone while other areas are engaged in other learning or skill activities. They should lock into position at full extension and at intermediate points as well as when retracted.
3. The structure of the flexible walls should be vertically hinged panels approximately 1ft. in width, ceiling high, with acoustical panels facing both sides of the wall.
4. The instructors' offices should have generous glass treatment to facilitate maximum visual supervision.

C. Colors and textures
   1. The colors throughout the entire complex should vary from zone to zone yet present business-like atmosphere.
   2. The surface textures of the walls should be of non-gloss finish.
   3. Prolific use of textured panels will not only serve the surface requirements very well but will also provide excellent tack surfaces. The attachment of chart rods and clips will further make these wall spaces more functional.

GREAT FALLS VOCATIONAL-TECHNICAL CENTER
Data Processing

I. Introduction

The last decade has offered business, industry, research, and society innumerable examples of computer applications. Regulation of precision machinery, bookkeeping prodedures, accurate market analyses, production and distribution schedules, personnel schedules, data retrieval, and time sharing communication networks are only a few examples of the apparently limitless scope of application of computer related processes.

The potential for employment in the technology of computer programming and related skills appears to be one of the most promising available to a vocational-technical institution.

II. Curriculum content

The following page outlines the basic curriculum for computer programming instruction as recommended by IBM in their publication, "Scientific Data Processing Courses in Vocational and Secondary Schools."

Preliminary training in records, classification of records, calculator operations and procedures, and information reproduction processes should be provided. Advanced instruction in computer procedures involving tape and scanner operations should be provided for in the basic space arrangements.

III. Space Relationships

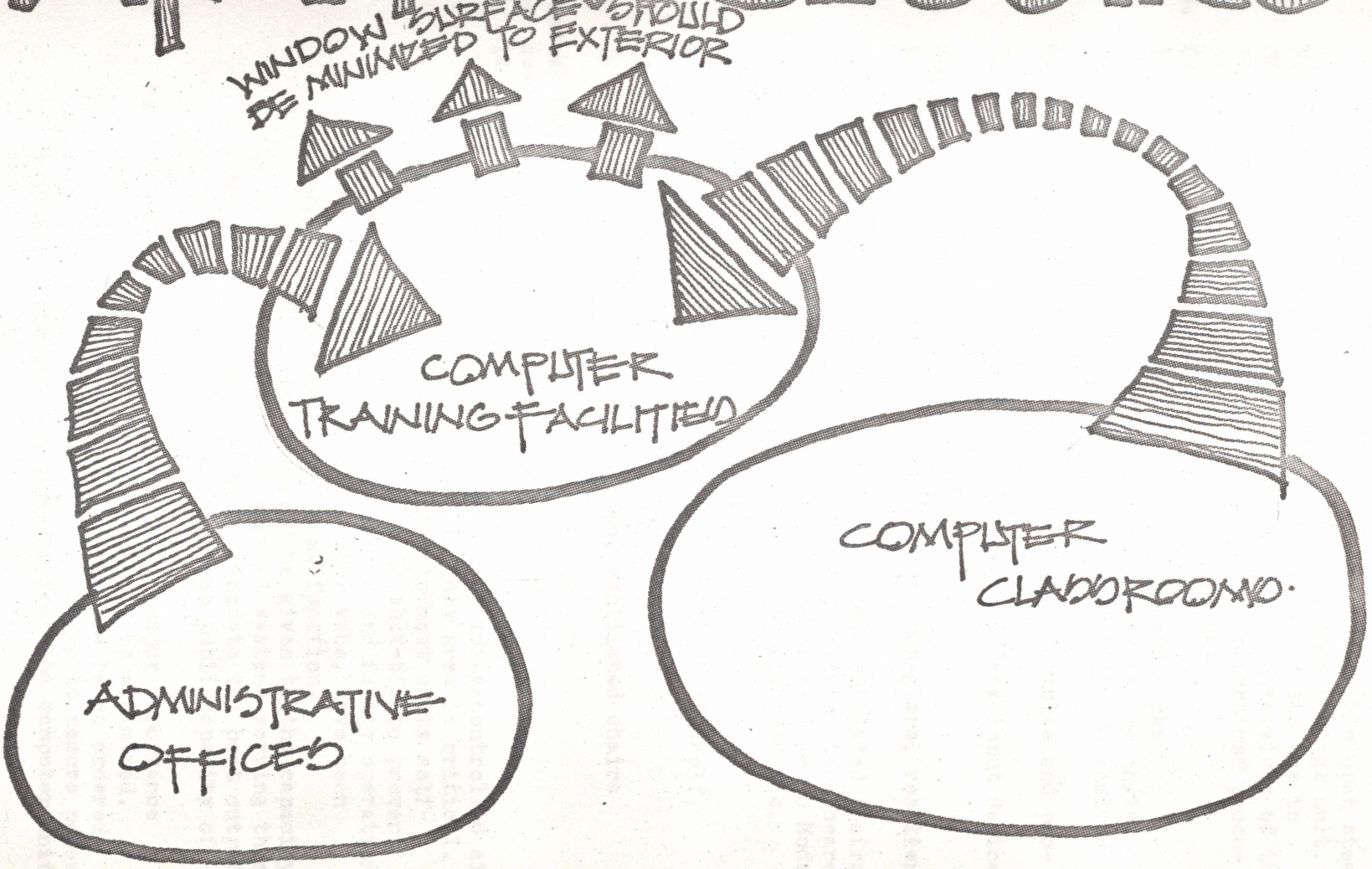
A. External

1. The increasing use of numerically controlled welders, computerized plotting devices, the application of computer processes to business and its integral relationship with electronics suggests that the computer training facilities be quite centrally located and readily accessible to the administrative offices to serve the institution's analysis and predictive requirements.
2. The space housing the computer equipment should be adjacent or close to the appropriate classroom spaces necessary for meeting the curriculum requirements of the IBM schedule.

B. Internal, (2100 sq. ft.)

1. The location of the five basic computer units should be arranged within the space of the computer operations center so that groups of 10 or more students can gather around each unit for group demonstrations and instruction.
2. The following spaces should be provided in the complex to permit adequate instruction routines and allow appropriate room for later addition of auxiliary units for data storage, cathode ray scanner unit, and tape converted storage units.
   a. Computer operations center.....(1175 sq. ft.), including carrel spaces
   b. Stock storage.....(200 sq. ft.)
   c. Office.....(80 sq. ft.)
   d. Key punch room.....(170 sq. ft.)

DATA PROCESSING



7. Conference chair
8. Adding machine, 10 key

D. Records storage

Two hundred-sixty-five linear feet of adjustable open steel shelving, 12" wide, should be provided for this storage unit. Many specific operational programs will require storage to maintain routine functioning on the records and services of the vocational-technical center, plus any other programmed procedures that may be required of data processing.

E. Keypunch room

1. Four key punch typing units, 29, with card racks
2. Four adjustable, ventilated, posture back typing chairs
3. Portables shelf table, 26" x 38" x 30", with two shelves under the top, caster mounted
4. Full range adding machine for verifying formulae and procedures
5. Space should be allowed for adding other data input devices as funds and operations require

F. Seminar room

1. Four work tables, 36" x 8' x 30", with non-glare, resilient tops
2. Thirty-two tubular steel, stacking type, ventilated chairs
3. Three 4' x 8' vertical panels of vinyl textured tack board
4. Thirteen 4' x 4' panels of writing surface similar to Modern-Cote that will accomodate lead, ball, or wick pencils, crayon or china marking pencils1

G. Library

1. Two hundred seventy linear feet of 10" wide, 5 shelf, adjustable, wall standing book shelving
2. Two reading tables, 3' x 4' x 30"
3. Four tubular steel, stacking type, ventilated chairs

V. Thermal Environment

A. Heating, cooling, and ventilating

1. Computer operations center

a. The supply of cooled, filtered, humidity-controlled air to the electronic equipment in this area is critical. Computer equipment has built into most units self-monitoring devices for automatic shut-off to prevent overheating and consequent damage and faulty operation. Dust particles, even minute spider webs, have been known to cause some items to malfunction.

Special attention should be given to the capacity of the thermal supply and control systems serving this complex and be designed to accommodate the heat output of the equipment, plus the maximum pupil capacity of the area.

*b. Prevention of solar heating is of major importance consequently, window surface should be minimized.

c. Internal and supporting spaces should be so ordered that the ventilating system will serve to remove paper dust and other air born residur from the computer unit arena.

2. Storage space
   a. The need for air conditioning to these spaces relates only to the dust and humidity control. Excessively dry paper products will cause the generation of static electricity by the large volume of high speed handling in the computer equipment and may tend to cause fouling of handling prodedures. Excessive moisture may reduce the structural strength and hardness of the paper stock items, again fouling thehandling processes in the machines.

GREAT FALLS VOCATIONAL-TECHNICAL COMPLEX
Health Occupations
Practical Nursing

II. Spatial Relationships
A. The practical nursing educational complex should be in close proximity to the following areas:
1. Dental training and other health occupation training areas
2. Technical library
3. Counseling area
4. Laundry facilities which serve food services, health occupation, and home economics

II. General Areas
A. The practical nursing complex will include these areas:
1. Storage (200 sq. ft.)

There should be 200 sq. ft. of walk-in storage to be used to store materials, equipment, models, and supplies. This storage must be lockable and should be designed to make teaching equipment easily accessable and will house such supplies as:

dishes	trays (8)
towels & washcloths (3 doz.)	basins
visual aids	thermometers
linen (4 beds)	enema pans (4)
soap	syringes
wheelchair	solutions
paper	TV stand

Storage should be accessible to the lab area, teaching area, display area, and the instructor's office.

The storage area will require a sink and small counter. Hot and cold water lines will be needed at the sink.

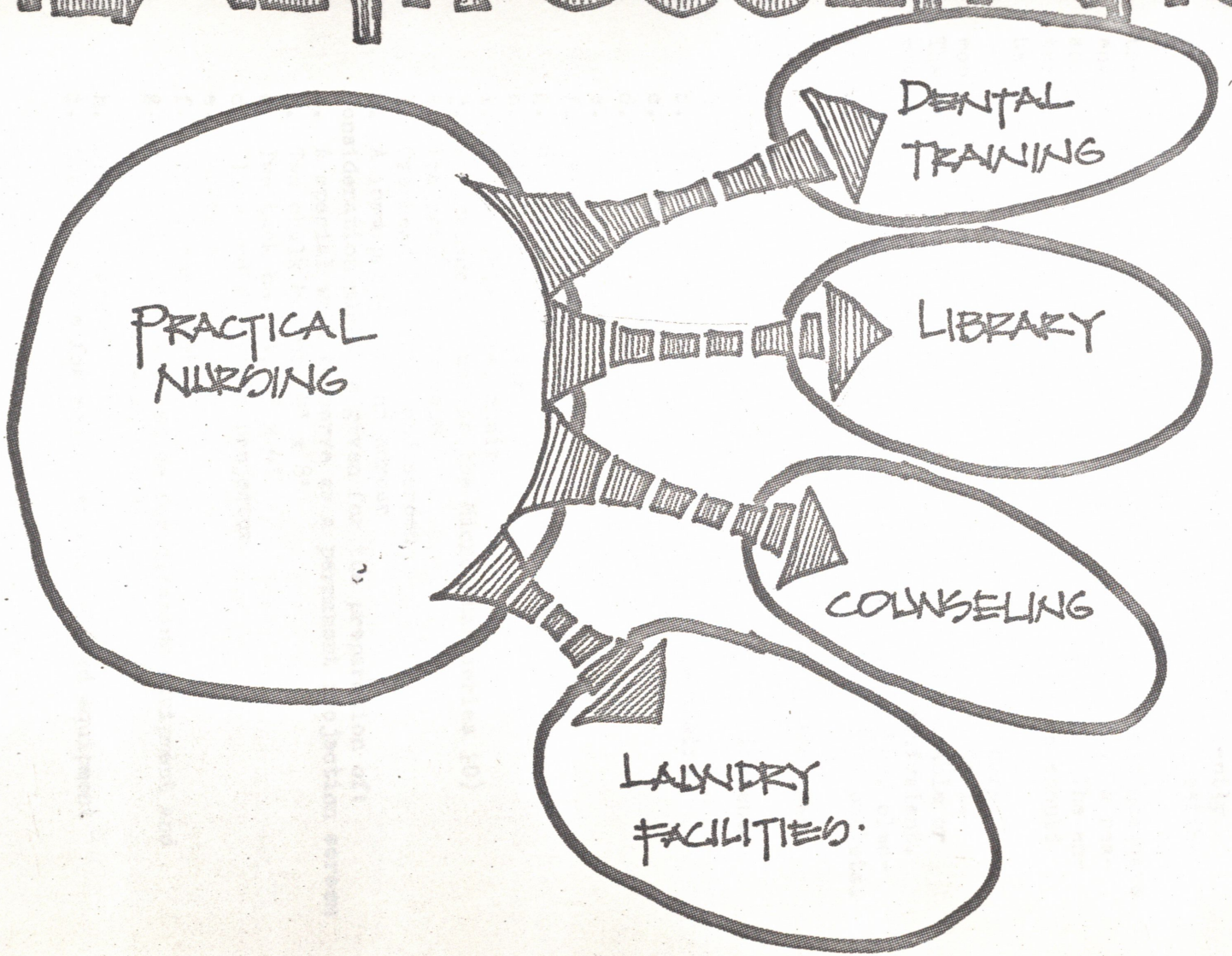
2. Locker and dressing area (200 sq. ft.)

Lockers to store street clothes for 25 students will be required in this area. There should be a small dressing room with toilet facilities in this space. A full length mirror should be installed in this area to facilitate ground necessities. Students will be changing from street clothes to uniforms and back to street clothes, therefore, storage for 120 uniforms will be required. The uniform hanging area should be provided with ventilation and garment racks. The 25 street lockers will be in use by students while attending classes.

3. Instructional area (800 Sq. ft.)

The instructional area requires floor space suitable for the activities of up to 25 students. Included in these activities are studying, observation of clinical demonstrations, practice clinical demonstrations, listening to lectures, observation of visual and auditory program, writing exams and reports, giving oral reports, small group discussions, etc.

HEALTH OCCUPATIONS



Ready availablity of audio-visual equipment should be assured whether in central storage or for this area only. General storage and laundry facilities should be near.

The room and floor should receive acoustical treatment to facilitate voice communication in normal tones. Windows are required, therefore, blackout curtains will be necessary for light control during the use of certain audio-visual aids. Lighting should be arranged for minimum glare and to assist in the optimum effectiveness of chalk board use. Approximately 75 foot candles are desirable.

Provision should be made to control heat sufficiently for year-round use of this room. A balance should be established between the desire for natural lighting (windows), and the problem of heat transfer during the summer so that adequate environmental control may be maintained year around at a reasonable cost. Air conditioning will be a necessity. The entrance to the room should be from the rear and there should be no passing through.

The room color, equipment, and design should be harmonious. The design should be plain and the colors cool. The ceiling should be sound proof and the walls operable or moveable. Desk surfaces should be of formica or equivalent.

Utilities required will include hot and cold water, electrical outlets every 6 or 8 feet, and 2 educational TV outlets.

Furnishings and equipment should include:

a. 8 tables which can be separated or joined together
b. to form semi-circular or rectangular units
Consideration should be made for expansion requirements in this area during special meetings
b. Twenty-five posture back, stacking type chairs
c. Teacher's desk
d. Two electric beds
e. Bedside tables
f. Overbed tables
g. Straight chair
h. Vinyl padded chair
i. Collapsible wheel chair
j. A microscope (such as the Micro Star series 10)
k. Projecting microscope
l. Overhead projector and screen
m. A 16mm projector and screen

Consideration might be given for the preparation of:

a. A special wall to serve as a permanent projection screen
b. Two chalk boards, 4' x 8'
c. Two tack boards, 4' x 4'
d. Slide and filmstrip projector
e. Bookcase
f. Pencil sharpener
g. Built-in sink with space for cleaning equipment and computer space on each side
h. Drawer space
i. Cabinet space for medicines and related equipment

e. Records storage.....(160 sq. ft.)
f. Seminar room.....(300 sq. ft.)
g. Computer library.....(200 sq. ft.)

C. Traffic
1. The movement of students around the six basic computer units will consist of two basic patterns.
a. Demonstration of equipment operation procedures to groups of students by the instructor
b. Supervised or independent student operation of the equipment
2. Maintenance personnel must be provided adequate working room around each unit; therefore, a space approximately 4 ft. wide between the wall and a unit and between units should be provided.
3. The operational relationships that are designed into the equipment units should be such that an operator feeding data cards in at the operation panel of the 1622 interpreter unit should have direct access to the switch panel of the 1620 console-typewriter unit. That arrangement would suggest the location of the 83 card sorter and the 407 accounting machine would be used to complete the semi-enclosure of a demonstration area of approximately 200 sq. ft.
4. The movement of personnel past the computer equipment to and from the supporting zones should not have to pass through the demonstration-operation arena. Traffic aisles past or around the computer equipment should not restrict access to the operation arena.

IV. Furniture and Equipment
A. Computer operations center
1. Console typewriter unit, 1620
2. Auxiliary data storage unit, 1623
3. Interpreter unit, 1622, with card rack
4. Verifier, 59, with card rack
5. Accounting machine, 407, with card rack
6. Card sorter, 83, with card rack
7. Key punch unit, 29, with card rack
8. Six carrels, 3' x 3', with adjustable wall lamps
9. Two stationary work tables, 30" x 60" x 30"
10. Portable shelf tables on 6" casters, 26" x 30" x 30"
11. Fifteen adjustable, ventilated, posture back typing chairs on casters
12. Two circuit panel storage cabinets, 34" x 60" x 42"

B. Materials Storage
Three hundred sixty linear feet of open 18" wide adjustable shelving should be provided for this storage unit.

C. Office
1. Instructor's desk, locking, 30" x 60" x 30", with resilient, non-porous top and underneath storage
2. Instructor's ventilated swivel chair on casters
3. Telephone
4. Book shelves
5. Work table, 28" x 38" x 30"
6. Two legal size, 4-drawer, locking file cabinets

4. Teacher's office and counseling area

This should be arranged and located so that a reasonable privacy level can be maintained for student conferences. Lighting, natural and artificial, should be provided to maintain approximately 75' candles on working areas. This should be designed to limit glare to a reasonable minimum. Windows for this area are desirable.** It may be in a complex of instructor's offices.

Acoustical treatment for the ceiling and floor is desirable. Additional treatment may prove desirable as the functional relationship and location of other segments of this structure are specified.

The thermal environment should be maintained within a 65 to 85 degree range. It will be necessary to evaluate exterior glass in these terms. Air conditioning is a necessity.

Access to this area should be in term of its total functional purpose and relationship. A movable wall is desirable between the office and counseling area.

Colors should blend, and a simple design should be maintained. Furniture should be consistent with the theme expressed in other sections of the facility.

At least one double outlet on each wall should be provided. It is recommended that each receptacle be served by a split 210 volt circuit with a single ground. This arrangement will double the available voltage and will provide more adequately for the simultaneous use of two or more teaching aids from a single location.

Tack boards should be available in both the office and counseling area. These should be 3' x 4'.

Furniture and equipment should include:

a. One four-drawer file cabinet with a lock
b. A desk
c. A comfortable padded chair
d. Clock
e. Bookcase
f. Desk lamp
g. One table, 36" x 96", with removable dividers approximately 18" high
h. Four casual chairs
i. Magazine rack
j. Pencil sharpener
k. Three wire baskets
l. Typewriter table or typwriter platform in the desk
m. Typewriter

Space will also be required for clinical instructors and should include a provision for counseling needs with furnishings and equipment generally in line with the recommendations already presented.

5. First aid and sick bay area (100 sq. ft.)

This area should be adjacent to the laboratory area. It should be separated from the laboratory and instructional areas by movable walls. All perimeter partitions should have sound barrier characteristics to provide privacy and comfort for those using the area. It is recom-

mended that artificial lighting be the sole means of illumination for this area. It is suggested that a rheostat be installed in the lighting circuits for this area so that light intensity can be maintained at varying levels. Air conditioning will be necessary, and a provision for ventilation of the area is needed. A texturized ceiling or acoustical plaster is desirable. Acoustical flooring (carpet) has a special application here. At least 3 double split electrical outlets should be provided.

Ready access should be available from either the laboratory or the instructional areas.

The visual environment should be appropriate to the total area. The design should be plain. Colors should be cool, pleasing to the eye, and blend with furnishings and equipment.

a. Hot and cold water should be furnished with a built-in sink.
b. There should be counter space on both sides of the sink, and work surfaces should be of formica or equivalent.
c. Storage space with sliding doors and drawer space should be provided under this work counter.
d. A cabinet for storing first aid supplies is needed.
e. A cot or bed
f. One casual chair
g. A paper cup dispenser
h. Pegboard, 24" x 36"

It is desirable that access to a lavatory facility be immediately available from this area. These facilities might be shared with the laboratory area.

6. Display case (20 sq. ft.)

This area should include an electrical outlet and an audio-visual plug. It should include lighting fixtures designed to illuminate a part or all of the space available. A part of the area should be glass enclosed and equipped with a locking device and electrical outlet. Additional open surface should be provided for displays of a type not requiring the protection of an enclosed space. It is suggested that the enclosed display area be 42" high and the open area 36" high. The display facility could be either stationary or portable. The base of this fixture could become locked storage for equipment that may be needed in conjunction with certain displays.

7. Study area (150 sq. ft.)

This should be separated from the instructional area preferably in or near the technical library area. It should provide seating for 10 to 12 students and include shelving and storage for a technical library center. It is recommended that seating be of two types.

a. An open area, counter, or table large enough to comfortably seat 5 or 6 students and 5 or 6 carrels equipped with audio-visual plugs and otherwise designed to facilitate the optimum use of the materials available in the technical library or central materials center.

b. Illumination should be provided at 75' candles on working surfaces and should be of a non-glare type.
c. If windows are provided, some type of light control will be required such as blackout curtains.
d. Acoustical treatment of ceiling and floor is desirable. The ceiling can be either acoustical plaster or tile. The floor should be carpeted.
e. Air conditioning is necessary. Provision should be made to maintain a temperature between 65 and 85 degrees summer and winter.
f. Storage, shelving, and equipment will be limited only by the role this area plays in relation to the central materials center and the general instructional goals that are developed. Facilities needed include:
   1) Two book cases
   2) One four-drawer file cabinet
   3) Ten or twelve stacking chairs
   4) One table, 72" x 36", or counter space designed to accomodate student study or research
g. Furnishings should be in harmony with those provided in other parts of the facility with colors that are cool and that blend with the furnishings. It should be pleasing to the eye and non-depressing. The design of the area should be approached with a view toward simplicity.
h. Work suffaces should be formica or equivalent. Walls should be operable or movable.
i. Electrical outlets should be placed at 8' intervals in this area.

8. Laboratory area (400 sq. ft.)

Acoustical treatment of the ceiling is recommended either through acoustical plaster or tile so that communication can be carried on in normal tones. Because of the activities normally taking place in this area, it is recommended that the floor be surfaced with material such as tile, terazzo, or a torginal type seamless flooring. The surface selected must be resistant to materials that will be a part of the learning activities carried out in the laboratory.

Illumination should be 75' candles on working surfaces and should be arranged to eliminate glare.

The thermal controls should be capable of maintaining a temperature range between 65 and 85 degrees summer and winter while providing adequate ventilation. Air conditioning will be necessary.

Access to the area should encourage the effective use of the laboratory as an extension of the instructional area.

Laundry facilities for towels, aprons, etc. should be near by.

Furniture shall be in harmony with other selections in the other sections of the program. Colors should blend with equipment, should be pleasing to the eye, cool, and non-depressing.

Work surfaces should be formica or equivalent, Walls should be moveable or operable.

Lavatory facilities should be available to those using this area. As mentioned previously, these might be installed to provide for the special requirements of the sick bay as well as the laboratory.

a. One tack board, 3' x 4'
b. One pegboard strip, 1' x 4'
c. At least two double sinks are required.
d. Four laboratory stools
e. Cabinets should be installed above the working area, and enclosed storage should be constructed below the work surface.

Cabinet space for medicine and related equipment should be provided.

a. One burner hot plate
b. Dishwashing equipment
c. Small refrigerator
d. Small steam sterilizer
e. Small steam inhalator
f. Small autoclave

GREAT FALLS VOCATIONAL-TECHNICAL CENTER
Health Occupations
Dental Assistant

I. Spatial Relationships

The dental assistant complex should include or be immediately adjacent to the following facilities or areas:

1. Laboratory
2. Darkroom
3. X-ray room
4. Operatories
5. Recovery room
6. Classroom which may be shared with other programs
7. Storage
8. Faculty office
9. Waiting room
10. Business office

II. General Area Considerations

A. Access

A special outside entrance should be provided for patients and doctors who will be used for demonstration purposes. Necessary parking whould also be provided for these people.

B. Some of the supplies are quite heavy, such as bags of stone or plaster. In the location of the several parts of this facility, consideration should be given to the problem of moving these into the building and the problem of distributing them to students.

C. Many of the facilities such as the laboratory, classroom, faculty office, storage room, and waiting room can be used in conjunction with other programs. In arranging these facilities, it is recommended that the location of the several areas be in terms of the most efficient use. However, this consideration should be in terms of long-term requirements as well as immediate efficiency.

III. General Areas

The dental assistant complex will include these areas:

A. Laboratory Area . . . . . 650 sq. ft.

1. Acoustical treatment

The ceiling should be treated with either acoustical plaster or tile. Because of the type of activities taking place in this room, carpet would not appear to be practical. If windows are included, it would be desirable to use a heavy shade to assist in holding noise to a minimum.

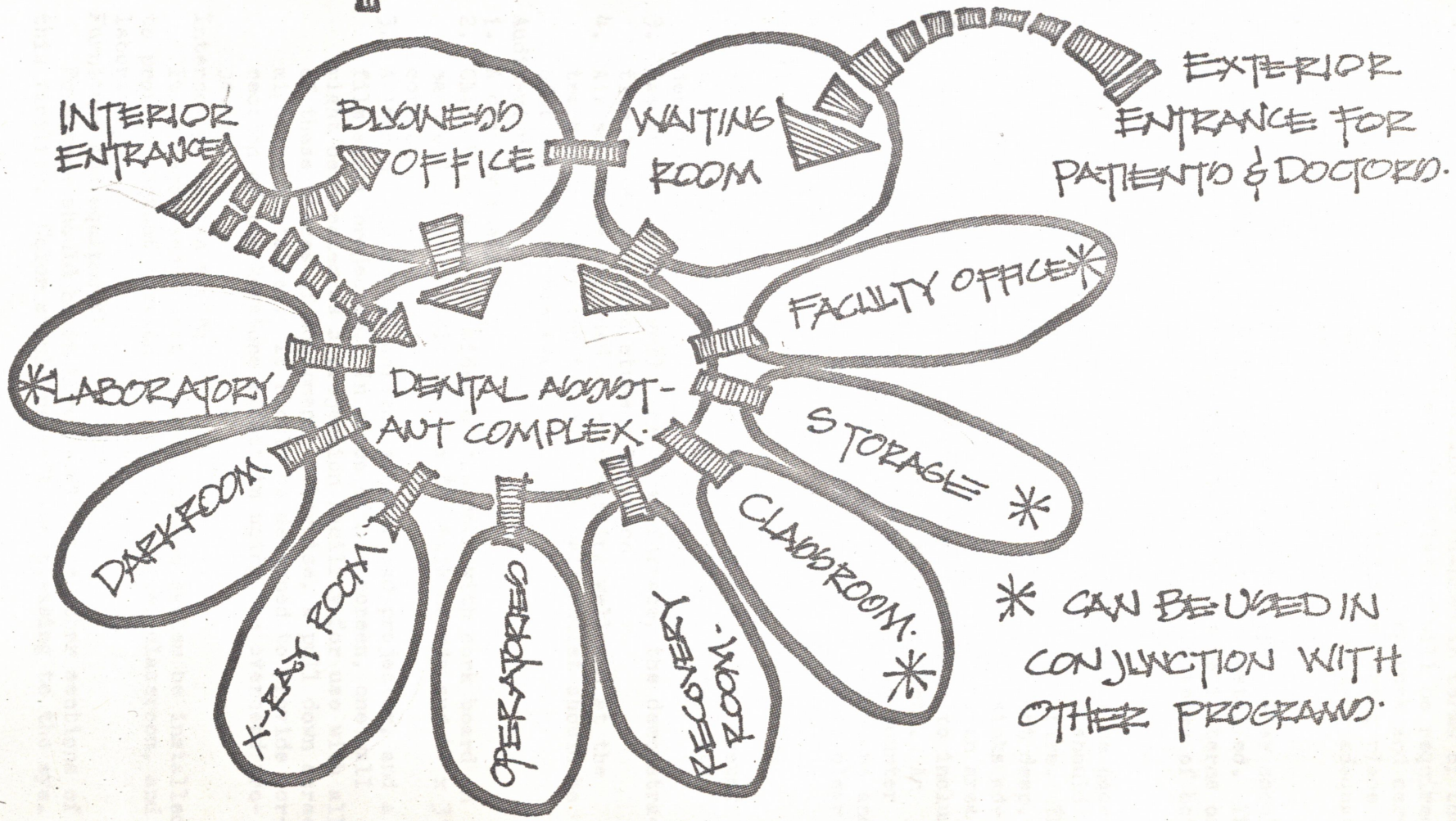
B. Illumination

It is recommended that light fixtures should be provided which will supply 100 ft. candles on the working surfaces. It should be designed to inhibit glare from chalk boards, demonstrations, etc. If natural light is used, blackout curtains will be necessary in conjunction with the use of certain audio-visual aids.

C. Thermal environment

Provision should be made to maintain a temperature range between 65^0 and 85^0 F. Air conditioning would seem to be necessary so that the facility could be used year around with

HEALTH OCCUPATIONS



comfort and efficiency. If air conditioning is installed, the location and size of windows should be planned in terms of the cost of operating such a system. Ventilation will be required for this area because of a great deal of casting work and certain odors that will result from the activities taking place here. These factors should be considered in providing adequate environmental thermal control.

D. Visual environment

Colors should be cool and pleasing to the eye. They should be coordinated with the equipment that is to be installed. The design of this area should be simple and should be in terms of the most efficient use of the space available, in terms of both teaching and maintaining it.

E. Special structural requirements

Since this area will be used for casting, it will be necessary that an area be provided where if molten metal should fly out of the casting machine, it would not start a fire. This area should be built in a well shape about 6 to 12 feet deep. Adjacent to this area would be needed a furnace and sinks adjoining each casting machine. Also required would be an area for laboratory engine arrangement. This would need to include four or five laboratory engines and connecting outlets. An area is also needed for study model trimming. Large counter should be provided for all the working areas and the stone and plaster area. Special stops are needed in the sinks to clear any stone or plaster being dropped by accidant.

F. Utilities

1. Hot and cold water to each of the four sinks
2. Electrical outlets approximately every 6 to 8 ft. around the room, plus at the demonstration table and each student location
3. Gas at the casting well, the inlay furnace, the demonstration table, and each student location
4. Air should be provided at each casting well and at the teacher demonstration table. Each wall outlet should be of the split double type.

G. Audio-visual

1. A display shelf
2. Chalk boards on two sides of the room with cork board on each end, these should be 4' x 8' chalk boards and 4' x 3' cork boards
3. A 16mm projector and screen, an overhead projector, and a film strip projector. In place of the screen, one wall might be treated as a projection facility for use with all of these pieces of equipment; otherwise, a pull down screen might be installed. It should be designed to provide correction of the keystone effect in using the overhead projector.

H. Intercommunication system

It is recommended that a communication system be installed to provide contact between the faculty office, classroom, and laboratory.

I. Furniture and equipment

Furniture should be in harmony with the other sections of this facility. Color should be soft and pleasing to the eye.

Included will be:

1. A teacher demonstration table, equipped with a sink
2. Sixteen student stations
3. A vinyl padded chair
4. Sixteen stacking chairs
5. Two casting wells
6. One inlay furnace
7. Vacuum investor
8. Three cast chipping vibrators
9. One model trimmer
10. One lathe
11. Four sinks, plus one sink at the demonstration table

IV. Darkroom . . . . . 80 sq. ft.

A. Acoustical treatment

Acoustical tilw would be desirable either through a texturized ceiling or acoustical plaster. This will aid in maintaining a comfortable sould level and facilities voice communication in normal tones. Carpeting is not recommended for this area because of the nature of activities that are carried on and because of its immediate conjunction to the laboratory and to the x-ray room.

B. Illumination

It is recommended that this area be treated entirely with artificial light; these should be safety lights. Approximately 40 ft. candles should be sufficient to meet the needs of this area. Provision should also be made for hanging x-rays to dry.

C. Thermal environment

Provisions should be made for maintaining a temperature range between 65° and 85° F., winter or summer. Air conditioning will be a requirement for comfortable use in the summer; and ventilation, due the recommendation of no windows, should receive particular attention.

D. Visual environment

Colors should be of a cool value, and design should be simple and in keeping with the general theme represented by the total facility.

E. Special structural requirements

There should be a lock on the door and walls should be surfaced in a very dark color. Special protection will be required against light entering the room. An area will need to be provided for x-ray tanks, and there should also be counter areas for working. It is recommended that working surfaces be formica or equivalent.

F. Utilities

Electrical outlets should be provided every 6 or 8 ft. around the room; these should be a split double outlet. Hot and cold water will be needed.

G. Furniture and equipment

1. A sink
2. Two x-ray tanks
3. Equipment to backlight developed x-ray films for examination by instructors or students

V. X-ray Room . . . . . 100 sq. ft.

A. Acoustical treatment

Either texturized tile or acoustical plaster would be desirable for the ceiling. The floor could be carpeted or

treated with some other type of resilient material to aid in noise control. Since this area will be adjacent to the operatories, carpeting would be a logical extension into this area; however, it would not be necessary.

B. Illumination

If windows are used, they should be installed in a way that will minimize the problems of heat transfer and light control. Some type of window covering would be necessary; it is not suggested that blackout curtains would be required for this area. Light should be maintained at approximately 75 ft. candles on all working surfaces.

C. Thermal environment

Provisions should be made for maintaining temperatures between 65° and 85° F., summer and winter. Air conditioning will be required for this area. Provision should be made to provide adequate ventilation.

D. Visual environment

Color should be of a cool value and should be pleasing to the eye. The design of the area should be simple and in keeping with the general theme represented by the total instructional area.

E. Special structural requirements

Lead screens will be necessary for safety precautions. Lead glass will be needed for the observation windows. Extra heavy walls for protection and mounting of x-ray equipment will be needed. Provisions will need to be made for the extra electrical requirements of this type of equipment.

F. Utilities

Split double electrical outlets should be provided approximately every 6 to 8 ft. around the room. Hot and cold water will be needed; and as mentioned before, there will be a requirement for meeting the special needs of the type of equipment to be installed in this area, particularly electrical needs.

G. Furniture and equipment

1. X-ray machine
2. Sink
3. Locked storage provision for developed x-rays
4. Equipment for displaying developed x-rays
5. One chair of a stacking type
6. X-ray tanks
7. Dental chair

VI. Operatories . . . . . 4 @ 100 sq. ft. ea. . . . . 400 sq. ft.
1 @ 150 sq. ft. for demonstrations and student viewing

A. Acoustical

Carpeting should be installed to cut down the high pitched sound of the high speed drill; also the use of drapes and any method of sound proofing the operatories. This would include either a texturized ceiling or acoustical tile.

B. Illumination

Light intensity levels should be maintained at 75 ft. candles under all circumstances. One large window should be installed in each operatory. Natural light is required in order to match restoration tooth shades.

C. Thermal environment

Air conditioning will be particularly desirable for this area because of the need to maintain patients in as relaxed a

condition as possible. Temperature should be maintained within a range of 65° to 85° F.

D. Visual environment

Color should be of a cool value to set patients at ease. There must be quality and design in the dental setup which will coordinate drapes, pictures, carpeting, etc.

E. Special structural requirements

Special cabinets will be required built for dental instruments, and special arrangements will need to be made for equipment installation and location of counter areas for working. All counter areas should be surfaced with formica or equivalent.

F. Utilities

Split double electrical outlets should be provided every 6 or 8 ft. around each of the operatories. Natural gas outlets should be provided in each operatory. Hot and cold water will be needed for a sink in each operatory, plus porvision for water at each dental unit in the operatories. Provision for air at each operatory is also required.

G. Audio visual

Both operatories should be equipped with one-way glass for observation of patient-doctor, patient-doctor-child, and patient-doctor-assistant relationships.

H. Furniture and equipment

Each of the four operatories should include:

1. A dental chair
2. A sink
3. A stool
4. Storage cabinet
5. A dental operating light
6. Soap dispenser, paper towel dispenser, paper cup dispenser
7. A mobile cabinet for oral excavation equipment
8. A dental instrument cabinet
9. Bench-type autoclave
10. An amalgamator
11. Waste receptacle
12. Rubber floor mat
13. Storage would be required for such things as bowls, mandrils, mouth mirror, pliers, scissors, shears, spatula, sharpening stone, carvers, chisels, enamel hatchet, excavators, forceps, hypodermic needles, amalgam pluggers, scalers, curad, tweezers, vices, pumice, resin, abrasive wheels, cotton rolls, head rest covers, paper cups, dental floss, impression compound, strip abrasives, stones, and similar items not metioned that are essential to the functioning of such a facility.

VII. Recovery Room . . . . . 150 sq. ft.

A. Acoustical

Carpeting is recommended here as well as a treatment for the ceiling, either acoustical plaster or a texturized tile to provide the most optimum atmosphere for patients who are recovering from various procedures exercised in the dental facility. Considerable effort toward insulation can be justified for this area so that persons in it are as domfortable as possible under the circumstances.

B. Illumination

Windows are recommended for this area so that a maximum

effort can be maintained to draw the individuals' attention away from their immediate condition. It is recommended that the potential for light be maintained at 75 ft. candles; however, it is recommended that a rheostat be installed in this area so that light levels may be maintained at varying desirable levels. Some means of light control would be necessary for the windows; this could be blackout type drapes, curtains, or drapes of varying types.

C. Thermal environment

Provisions should be made to maintain a temperature variation with the range of 65° to 85° F. Air conditioning is desirable here and provision for ventilation is needed to maximize the comfort of the persons utilizing the space. The amount of window space mentioned earlier should be determined in view of the requirements of the heating, cooling system and the amount of heat transfer that would be involved.

D. Visual environment

The color should be of a cool value to set patients at ease. Design should be simple and maintain the theme generally presented throughout this entire facility. Particular attention should be made to making this specific area attractive and restful; relaxing for the people who will be using it. Concern should be evident in the type of drapes, carpeting, pictures, lamps, and other furnishings that are provided for this area. Although it is not specifically covered in this area, provision might be made to present some form of relaxing music, if desired, into this area. It is a continuation of the philosophy that the patients should be made to feel as comfortable as possible.

E. Special structural requirements

There will need to be sufficient room for a bed and the attendant furniture. In the overall design, this area should be located ideally immediately adjacent to bathroom facilities.

F. Utilities

Electrical outlets should be provided at every 6 or 8 ft. of wall space with a split double outlet at each location. Hot and cold water will be required.

G. Intercommunication

It is recommended elsewhere that an intercommunication system be installed. This might be a desirable means of making available music for the recovery room and perhaps certain other areas, such as the operatories through a central console.

H. Furniture and equipment

1. A bed
2. Two casual stacking type chairs
3. A couch
4. Magazine rack
5. Bookcase
6. End table
7. Floor lamp
8. A sink
9. Paper cup dispenser
10. Medicine cabinet

VIII. Classroom (to be used in connection with the practical nursing classroom)

Classroom facilities are desirable for this area, however, this

is a function of the area or facility that will not be utilized on anything approaching 100% basis. Therefore, it is recommended that in locating the dental assistant program, the classroom facilities might be situated in a position that would allow the joint occupancy by more than one group. Therefore, the general design and capacity of the room should be in terms of the area as it is intended to serve. The intent here will be to generally describe it in terms of its application to this particular section of the program with a consideration given to a larger number that might use it for other purposes.

A. Acoustical

A treatment for sound control is recommended for the ceiling, either through the use of acoustical plaster or a texturized tile. The treatment for the floor should be a continuation of the philosophy expressed in the treatment of other areas. Carpeting is recommended as a substantial improvement in the atmosphere of the area. Many surfaces are available that have an acoustical nature. One of these should be utilized to better or more effectively allow the use of an activity type curriculum while still maintaining the ability to communicate in normal tones.

B. Illumination

Provision should be made to maintain a light level at 75 ft. candles in all weather conditions. Windows are required and therefore, their location and size should be in terms of glare heat transfer, summer and winter. Provision for light control during those times when certain audio-visual aids are required would necessitate the installation of blackout curtains. Lighting should be designed to provide optimum visibility for demonstrations, charts, and chalk board use.

C. Thermal environment

Air conditioning will be necessary for the use of the facilities summer and winter. Overall provision should be made to maintain room temperature within a range of 65° to 85° F. A system of ventilation is also necessary.

D. Visual environment

Color should be of a cool value and should be selected to blend with the equipment that is to be installed. Color should be pleasing to the eye and combine to present an attractive appearance to the students. Design should be simple and all parts of the room, including drapes, carpeting, equipment, etc., should reflect a continuous theme or harmonious relationship.

E. Special structural requirements

It is recommended that a tiered classroom be provided so that all students will have a maximum opportunity to see demonstrations.

F. Utilities

Double split electrical outlets should be provided every 6 to 8 feet around the classroom. Hot and cold water should be provided.

G. Audio visual

1. Two chalk boards, 4' x 8'
2. Two tack boards, 3' x 4'
3. Display areas
4. Book shelving
5. One way windows to the operatories
6. A 16mm projector and screen

7. Slide projector
8. Overhead projector
9. Audio-visul plug

H. Furniture and equipment
1. Twenty-five student desks
2. Twenty-five chairs; if the type desk selected requires an extra chair, these should be of a stacking type.
3. Teacher's desk
4. Padded vinyl teacher's chair
5. Shelving
6. Magazine rack
7. File cabinet
8. Towel dispenser
9. Waste receptacle
10. Pencil sharpener
11. Demonstration table
12. Two casual chairs
13. Sink
14. Intercommunication outlet

IX. Storage . . . . . 150 sq. ft.

A. Acoustical

A continuation of the treatment applied to the other areas of this facility would be appropriate for the storage area; however, no particular sound problem is anticipated.

B. Illumination

If windows are used, some type of light control would be desirable as a hedge against fading and sunspot damage. Generally, light should be maintained at a level consistent with that maintained throughout the building.

C. Thermal environment

Ventilation will be necessary to maintian a consistent atmosphere for protection of the materials stored. The air conditioning recommended for other parts of the building should be extended to include this area.

D. Visual environment

Color should be ight and in harmony with those used in areas adjacent to this room. Such a design as this should maintain a simple theme.

E. Special structural requirements
1. Moisture proof areas for storage of 100-pound drums of stone and plaster and other materials
2. Area which is dry and free from rediation, lead lined preferred
3. Area for storage of all paper materials used for dental offices
4. Area for scholastic charts, graphs, and materials

F. Utilities

Electrical outlets should be provided with at least one on each wall. Care should be exercised in assuring that the installation of these outlets is not made in such a way as to interfere with the equipment that will later be stored here or with the installation of the storage facilities as such.

G. Furniture and equipment

This area should include:
1. Open shelving, 15' x 5' x 15"
2. Locked storage
3. Drawers
4. Counter storage

X. Faculty Office . . . . . 200 sq.ft.

A. Acoustical

A texturized ceiling, either acoustical plaster or tile, should be installed. Carpeting is recommended for the floor so that conversations may be carried on in normal tones.

B. Illumination

If natural lighting is used, windows should be located to provide a minimum amount of glare. If these are installed, drapes should also be used that will assist in the control of extraneous sound. It is recommended that light intensity be so designed as to maintain a level of not less than 75' candles for this area.

C. Thermal environment

Air conditioning should be provided and generally, provision should be made to maintain a temperature range between 65° and 85° F. Ventilation is also necessary and/or an exhaust fan. This is an area where a great deal of work can be accomplished if the atmosphere is such as to encourage it. It is recommended that all parts of this facility be evaluated in terms of the hoped for gains to the instructional program that may be accomplished by the optimum utilities of this facility.

D. Visual environment

Colors utilized here should be in harmony with those selected for the other sections of this total facility. They should be pleasing to the eye and generally in their combination present an attractive appearance.

E. Utilities

Electrical outlets should be placed every 6 to 8 feet around the room and should be located in terms of the equipment and furniture to be installed. Hot and cold water would be required, and bathrooms should be a part of or adjacent to this area.

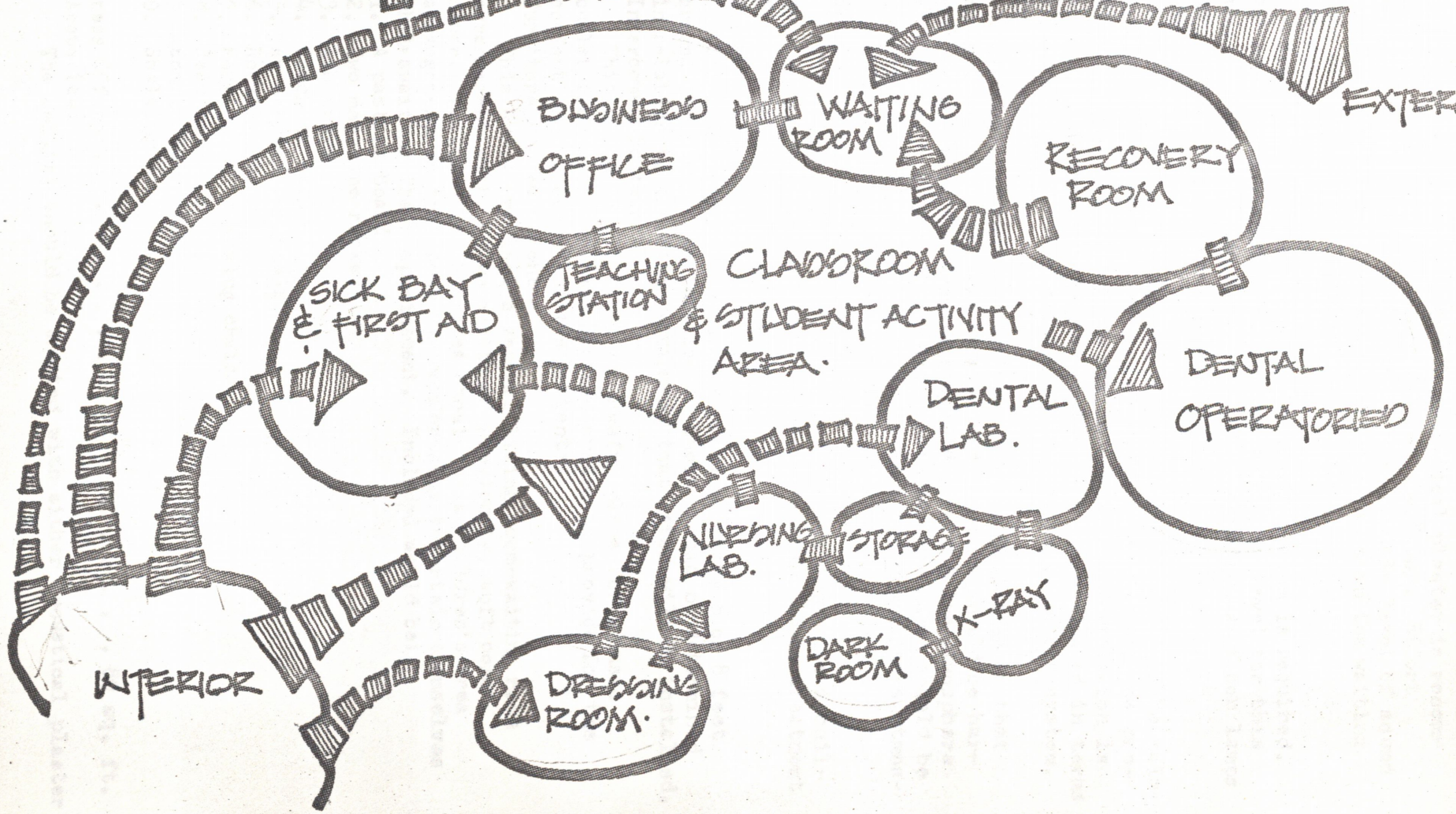
F. Intercommunications

It is recommended that any communication system be extended to include this area..This might also be a place where music, at certain times and under certain conditions, might be beneficial to the purposes of the area.

G. Furniture and equipment

1. Two 4-drawer file cabinets
2. Two bookcases
3. Typing area and typewriter
4. Desk
5. Six casual stacking type chairs
6. Visitor seating; this can be a couch, sofa, a comfortable chair or lounge type furniture
7. Box storage area
8. Clock
9. A coat hanger or closet
10. Ditto machine
11. Towel dispenser
12. Paper cup dispenser
13. Soap dispenser
14. Audio visual screen
15. Small refrigerator
16. Pencil sharpener
17. Dry copy machine
18. A table, 30" x 72"
19. Waste receptacle
20. Eye-level storage with sliding doors

HEALTH OCCUPATIONS



XI.. Waiting Room . . . . . 140 sq. ft.

A. Acoustical

A texturized tile ceiling or acoustical plaster is recommended. Carpeting is recommended for the floor. Effort should also be extended to provide a reasonable level of sound proofing from the other areas so that persons in the waiting room may feel as comfortable as possible.

B. Illumination

Reading quality lighting in the waiting room is required. 75' candles is considered a minimum intensity level for this area and should be supplemented with such things as floor lamps and reading lamps as may be necessary.

C. Thermal environment

It is recommended that the temperature of this area be maintained between 65° and 85° F. and that air conditioing be provided so that this objective may be achieved. Ventilation is also desirable and should be provided for and evaluated in terms of its effect of the operation of the heating, cooling system.

D. Visual environment

Particular attention should be paid to this area so that an optimum atmosphere may be achieved. Colors should be harmonious and restful; furniture should maintain the atmosphere of the area. Drapes, carpeting, pictures, and lamps should be selected with a view toward a harmonious and comfortable atmosphere.

E. Special structural requirements

This room would be rather large and should provide a children's room to the side or a children's corner. Some treatment for this objective would be desirable.

F. Utilities

Electrical outlets should be provided every 6 or 8 feet around the room. The location of these should be determined in relation to the other equipment that later will be installed.

G. Intercommunication

This would be a logical and useful place for a music outlet from an intercommunication system to provide for the comfort and enjoyment of the patients.

H. Furniture and equipment

This should reflect a general living room-waiting room arrangement with, as we mentioned previously, soft color decor. Included in this area should be a children's area arrangement so that they can comfortably entertain themselves while awaiting their appointment. Included would be:

1. A pasting board
2. Two magazine racks
3. Ash trays
4. Couch or sofa
5. An overstuffed chair
6. Rocking chair
7. Four casual stacking chairs
8. Reading lamps
9. End table
10. Shelving

XII. Business Office . . . . . 80 sq. ft.

A. Acoustical

The ceiling should be treated with either acoustical plaster

or a texturized tile. Carpeting should be provided for the floor so that sound may be controlled as much as possible and persons using the room consistently may do so with a reasonable amount of comfort.

B. Illumination

If windows are utilized in this area, light control procedures would be necessary. Blackout drapes, curtains, or drapes of some kind would be used for this purpose. The light intensity should be maintained at a level consistent with good working conditions; this is recommended to be not less that 75' candles under all exterior conditions. The installation of windows should reflect consideration for the problems of glare, heat transfer, and aesthetic considerations.

C. Thermal environment

Temperature should be maintained between a range of 65° to 85°, winter and summer. Air conditioning will be necessary for the use of the facility in comfort during the summer months. Ventilation should be provided.

D. Visual environment

This area should be an attractive greeting to those coming to use this facility. Color should be cool and pleasing to the eye and should be in harmony with the furniture that is installed for this area. All furnishings, including drapes, carpeting, pictures, lamps, and so on should reflect a continuing and pleasing theme. The design of the room should be simple and in keeping with the remainder of the total facility.

E. Special structural requirements

Counter space should be provided for such work as may require that type of facility; and a number of cabinets, bookcases, and storage closets should be provided for the convenience of the latter.

F. Utilities

Electrical outlets should be provided every 6 or 8 feet about the room. They should be located so that the installation of the equipment will not interfere with their use.

G. Audio visual

Telephone communication for mock appointments and practice would be useful.

H. Intercommunication system

This would be the logical location for the console of such a system. The personnel of the business office would be able to select and transmit music to selected areas at times when it was deemed useful or advisable and would be the place to which messages would come. These too, under cetain conditions could be transmitted to the proper location.

I. Furniture and equipment

1. A desk, 30" x 60"
2. Padded chair
3. Standard 4-drawer file cabinet
4. Legal size file cabinet
5. Desk lamp
6. Waste receptacles, two
7. Typing table
8. Typewriter
9. Intercommunication system console

10. Telephone, dry photo copier
11. Under counter storage
12. Locked storage
13. Drawer storage
14. Coat rack or closet

GREAT FALLS VOCATIONAL-TECHNICAL CENTER
Home Economics

I. Introduction

The home economics department in the area vocational school will have the important task of preparing women for better vocational possibilities in the area of home economics. In addition the training will be designed to provide courses to help the homemaker improve homemaking skills in the area of clothing, cooking, sewing, and child development and guidance.

II. Observable Trends

There is a great need for trained people who can skillfully do housecleaning activities, alter garments, construct drapes, accomplish commercial sewing, and work as assistants in nursery schools. In conjunction with the food service activities the home economics department could be expected to help train short order cooks, fountain girls, and waitresses. One important aspect of such training involves good grooming and clothes care. This area of home economics training could be expected to correlate with the food service area to better prepare the student to successfully work with the public in the area of food preparation and service.

III. Space Relationships

The home economics department should be in close proximity to the following areas:
A. Food services
B. Distributive education
C. Laundry facilities

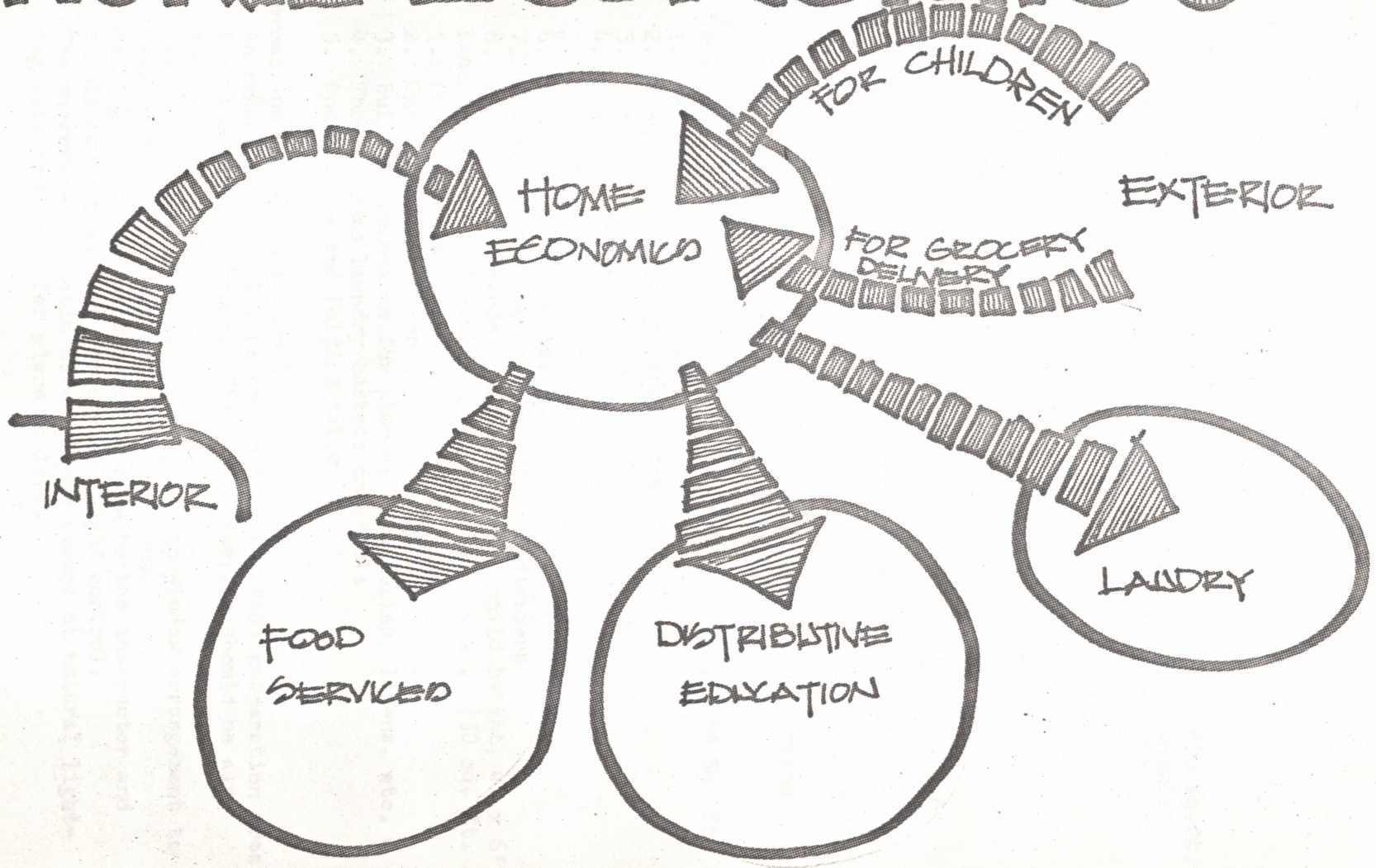
IV. Traffic

A. Nursery school: An entrance should be provided for easy and safe delivery and pick-up of children.
B. Grocery and other items being constantly brought into the home economics area necessitates an entrance close to the main drive area.
C. A central entry should be provided in the home economics complex so that entering and departing students traffic will not disturb classes.

V. Furniture and Equipment

A. Foods: Demonstration Kitchen . . . . . 200 sq. ft.
1. One refrigerator with large freezer
2. One electric range
3. One gas range
4. One demonstration table at work height, 34" x 36"
5. One sink with garbage disposal unit
6. One dishwasher

HOME ECONOMICS



7. Counter, 6' x 4'
8. Cabinets above and below counter
9. Built-in pull drawers for storage of silverware, etc.
10. Closed shelves along food storage area
11. One set aluminum cookware
12. Student tablet arm chairs, 25
13. One 8-place setting of dishes
14. One large extending dining tables
15. One blender, mixer, coffee maker
16. One bulletin board
17. One chalk board

B. Sewing Area . . . . . 1600 sq.ft.
1. Eight brand-name sewing machines per class of 25 people
2. Two heavy-duty power sewing machines requiring 220V
3. Eight cutting tables, 4' x 6'
4. Eight ironing boards
5. Eight electric hand irons
6. Pressing equipment
   a. Four sleeve rolls
   b. Tailor hams
   c. Paint boards
   d. Clappers
   e. Hem markers
   f. Fabric samples
   g. Drapery samples
7. Full length mirror
8. Dressing and fitting area, closed with movable screens
9. Two bulletingboards, 5' x 4' x 6'
10. One chalk board, 4' x 6'

C. Nursery School Area . . . . . 450 Sq. ft.
1. Ten small tables 3' x 4'
2. Twenty small chairs, child size
3. One refrigerator
4. One electric stove
5. Sink with hot and cold water
6. Play equipment and toys
7. Playhouse area with movable 3' x 4' dividers
8. Two bulletin boards and chalk boards, child height, 4' x 6'

D. Laundry Area . . . . . 150 sq. ft.
1. One commercial washer
2. One commercial dryer
3. Built-in cupboards for storage of supplies, linens, etc.
4. Three canvas laundry baskets on wheels
5. One sorting and folding table

VI. Thermal and Visual Environment

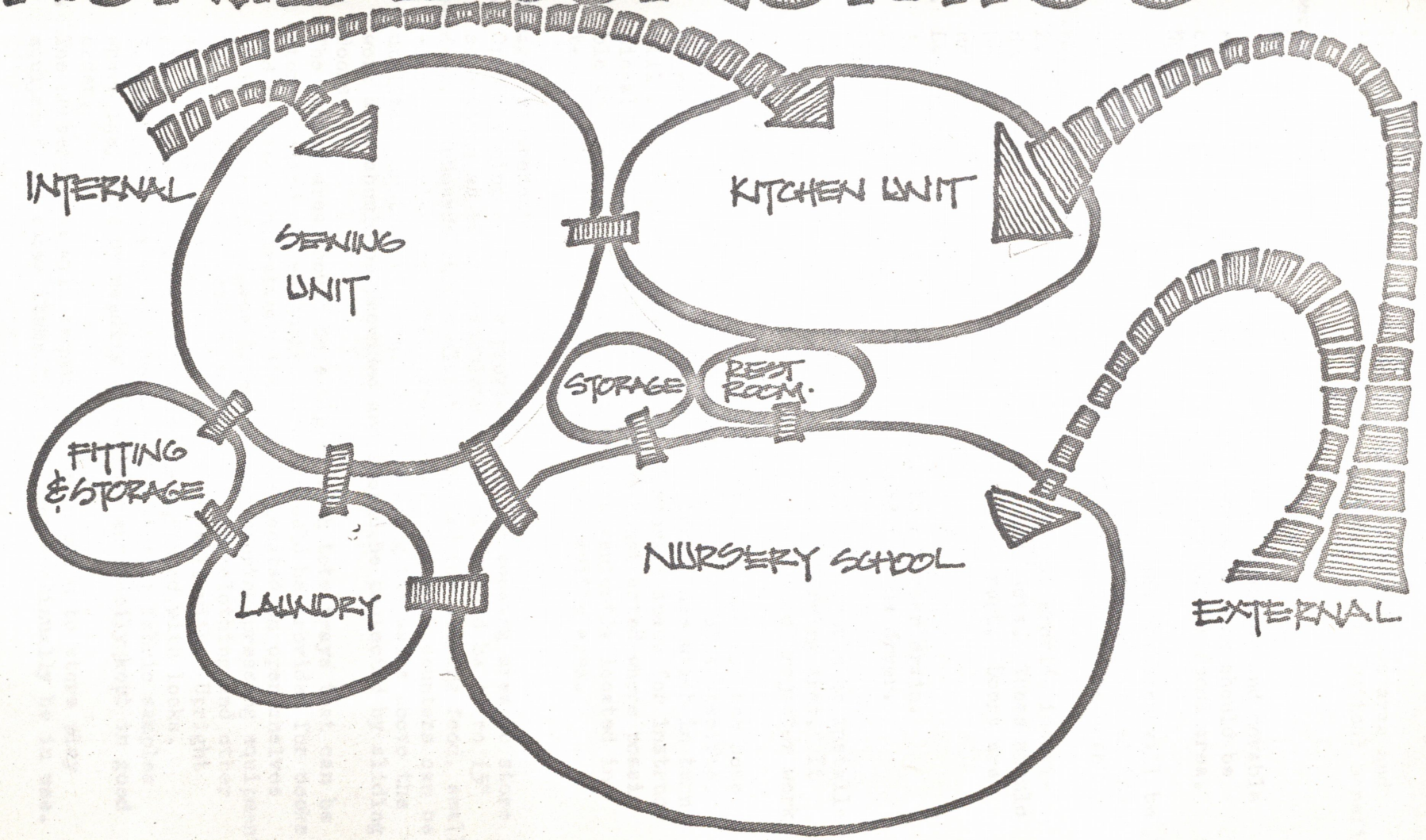
A. An exhaust system will be required in the food preparation area to dispel cooking odors. The entire complex should be air conditioned.

B. Careful consideration should be given to window arrangement to prevent excessive heat and glare build-up.

C. Heating controls should be adjustable by the instructor and should have provisions for day and night control.

D. The nursery area should have a large amount of natural lighting with provision for glare control.

HOME ECONOMICS



E. It should be possible to darken the classroom and nursery area for movies.

F. The entire complex, with the exception of the foods area and the laundry facilities, should be carpeted for acoustical benefit.

VII. Special Requirements

A. Foods

A demonstration platform with overhead mirror and movable equipment for teaching food preparation to groups should be constructed at the front of the classroom in the foods area.

B. Nursery School

1. A rest room designed to serve nursery age children will be required in the nursery school area. This should have an internal wall divider so that one rest room could serve both male and female children.

2. The entry way to the nursery school must provide individual lockers for storing hats, coats, and boots. These should be constructed of wood and be open at the front. Doors are not necessary.

C. Laundry Area

1. The floor should slope slightly to a center drain.
2. An exhaust system will be required for the dryer.

D. General

Permanent screens for audio-visual work should be installed in the classrooms, nursery school, and serving area. It should be possible to tilt screens for overhead projector work to eliminate the keystone effect.

E. An important consideration in providing storage for the home economics area is that the subject matter is quite specific. There will tend to be a minimum of library use which in turn will require an increased amount of storage space for instructional materials. Drawers should be constructed where possible and covered or enclosed storage conveniently located in terms of the intended function of the specific area.

VIII. Storage Requirements

A. Open shelving should be provided for the cooking area to store such items as books, pamphlets, etc. It should be 12 ro 15" deep. Cupboards should also be provided for storing food, small equipment, utensils, etc. Space under the work counters can be utilized for this prupose. Storage along the walls above the work area should be provided and should be protected by sliding doors.

B. The sewing area should be equipped with tote trays that can be stored behind locked doors. Space should be provided for books and related publications that can be located on open shelves 12 to 15 " deep. Space is needed for storing pressing equipment. Space should be provided in which to hang clothing and other material after it has been pressed or dealt with. Upright closets are desirable and should be equipped with locks. Special provision should be made for storing fabric samples where they will be readily accessible and easily kept in good order.

C. The nursery area will require space in which to store play equipment and other items that will not continually be in use.

Shelving should be provided for books, magazines, etc. at a height suitable for the age of the group who will be using the area as well as space that will not be accessible to the children without the help of the supervisor. Storage space is needed for coat wraps and boots.

GREAT FALLS VOCATIONAL-TECHNICAL CENTER
Culinary Arts

I. Introduction

The outlook of an increasing need for workers trained in quantity food preparation and service is positive. An increasing number of women will be employed in technological productivity. An increasing number of students will be fed in public schools, advanced learning institutions, and in industrial training food services.

Automated forms of food preparation will continue to modify the foods preparation and services industry. Consequently, retraining courses will be required of experienced adult workers in that occupation.

An adequate and functional curriculum should therefore include two basic levels of instruction: entry level training and speciality skills training.

II. Space Requirements

A. External

In that food storage, preparation, and service is to be a part of the curriculum of the Great Falls Vocational-Technical Center, it is appropriate that food services be made available to the students, faculty, and administrative staffs of the institution. The cafeteria-dining service should then be centrally located in order to be more equally accessible to all physical areas of the school.

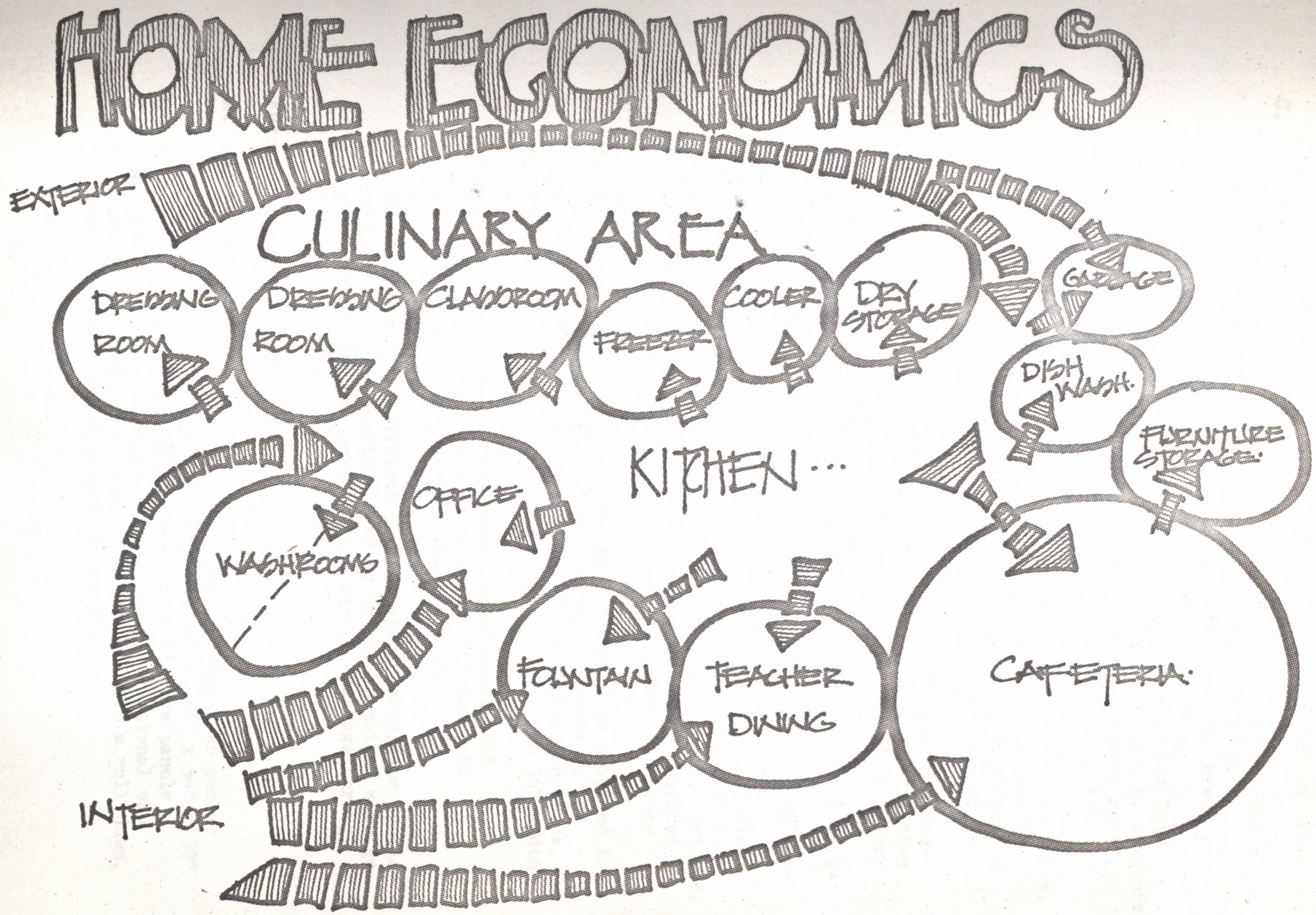
It should also be accessible to large delivery trucks that are assigned the task of delivering large quantity orders of food stuffs to the kitchen storage spaces. In the case that access must be provided for in the form of an under pass of second story construction, a minimum overhead clearance of 13 ft. from the driveway surface to the bottom edge of any overhead construction should be included in the design. The kitchen storage units and cafeteria dining area should be on the ground floor level.

B. Internal space relationships

1. Two major divisions of the cafeteria area are to be considered in this report.
   a. Dining spaces
   b. Kitchen training spaces

The following subdivisions of these spaces are identified:

1. Cafeteria dining area, seating 500 . . . . . 3300 sq. ft.
2. Teachers' dining area, seating 30 . . . . . 750 sq. ft.
3. Food serving lines . . . . . 250 sq. ft.
4. Food preparation zone . . . . . 1000 sq. ft.
5. Food storage zone . . . . . 670 sq. ft.
   - Frozen food . . . . . 200 sq. ft.
   - Cold food . . . . . 220 sq.ft.
   - Dry storage . . . . . 250 sq. ft.
6. Fountain and short order . . . . . 575 sq. ft.
7. Garbage service . . . . . 120 sq. ft.


HOME ECONOMICS
EXTERIOR
CULINARY AREA
DRESSING ROOM
DRESSING ROOM
CLASSROOM
FREEZER
COOLER
DRY STORAGE
GARAGE
DISH WASH.
FURNITURE STORAGE
KITCHEN...
OFFICE
WASHROOMS
FOUNTAIN
TEACHER DINING
CAFETERIA.
INTERIOR

8. Classroom . . . . . 750 sq. ft.
9. Dressing rooms and restrooms . . . . . 800 sq. ft.
10. Food service office . . . . . 200 sq. ft.
11. Furniture storage . . . . . 500 sq. ft.

C. Traffic

1. Personnel will be required to move freely throughout the entire complex during peak food service periods but restricted while the cafeteria sections are being used for large or medium group instruction sessions.
   a. Kitchen personnel should have free access to the food storage sections, the classroom, office, fountain, teachers' dining room, furniture storage, and the dressing room so that continuous learning activities are available.
   b. Patrons of the fountain and teachers' dining room need not have free access to the kitchen, classroom, or office. A double serving door in the service corridor near the office and the food serving line should be a sufficient barrier for "b" traffic and allow free passage for "a" traffic.
   c. Table service to the teachers' dining room should provide learning experience for students in the activities of food and soiled dish bussing, table spreading, serving, and clearing.
2. Personnel traffic directly between the kitchen and cafeteria is required to provide learning experience in banquet serving for such events as graduation banquets, hosting notable guest speakers, etc.
3. Student access to subdivided areas of the cafeteria dining space is required for small or large group instruction sessions when these spaces are required for classroom activities.
4. Personnel access to the dressing rooms should be provided from the nearest exterior point to permit them to change into food service uniforms.
5. Personnel access to the receiving pad should be provided to permit learning experiences in receiving, counting, and storing foods merchandise as part of the training process.
6. Materials traffic will require doors of a minimum 36" width in the following locations:
   a. Both entrances to the frozen food storage unit
   b. Both entrances to the refrigerated storage unit
   c. Both entrances to the dry storage unit
   d. Both entrances to the garbage unit
7. Double doors, or equivalent passage space, should be provided to the service corridor leading to the furniture storage room, the receiving dock, and the service passage through the food serving line.

III. Furniture and Equipment

A. Cafeteria dining section

1. Combination drinking fountain and water dispenser cooler
2. Twenty-two wall folding dining table units, 16' x 54" x 30"
3. Two portable folding wall panels, with 4' wide panels finished in marking board surface for instructional use
4. Each subdivisible area should be provided with a roll down, anti-keystone mounted projector screen.

5. The classroom furniture required for these spaces should be tubular steel stacking type, fold-away tablet arm student chairs stored on 30-chair capacity dollies in the furniture storage room.

B. Teachers' dining area
1. Small counter top freezer chest for storing chip or cube ice
2. Eight circular tables, 42" x 32", folding
3. Thirty-two tubular steel, body form stacking type chairs
4. Water service fountain in conjunction with the freezer chest
5. A small space must remain clear near the ice chest and water service fountain for the storage of bussing vehicles.

C. Food serving lines

One line of portable, non-fixed modular serving units is needed to provide adequate food service and sanitation for the early years of enrollment. As enrollment increases, the addition of a second serving line will provide serving facilities for 500 cafeteria meals in a 30 minute period. The backup equipment specified in the following inventory is adequate for one cafeteria serving line and the teachers' dining area. Some additional backup equipment would be required to support a second serving line.

Overhead drop panels should be an operavle part of the cafeteria serving line as a part of the dividing partition to construct a teaching area during hours when the food service is confined to the fountain and teachers' dining area.

1. Electrically operated steam table, 220/2C8V, three phase with standard 6" deep food pans, gravy, sauce, and soup wells, 7 ft. long.
2. Electrically operated chill counter for salads, gelatin, and dairy products, 3 ft. long
3. Electrically operated freezer counter for frozen desserts and crushed ice service, 2 ft. long
4. Slotted, insulated backup warming cabinets, 110V operated, stacking type, 4 units
5. Slotted, insulated backup chilling cabinets, 110 V operated, 3 units
6. Four backup cabinet dollies
7. Electric cah register, with 3 drawers and sales record tape, on a caster mounted checking table, 30" x 36" x 30"

D. Food Preparation
1. Stainless steel, double tub vegetable sink, centered between two hardwood top vegetable work benches with open tool and utensil racks and doll mounted vegetable and garbage tubs underneath.
2. Potato peeler, 50 bb capacity, 220V, 8 phase
3. Mixer-blender, shared with the bakery line, 220 V
4. French fry well, natural gas, 20" x 36", with three baskets and space for a dolly mounted vegetable tub underneath
5. Cast iron general purpose grill top range, natural gas, 28" x 60" top, with vegetable, batter, and produce coolers underneath
6. Steam jacketed tilting kettle, 40 gallon capacity
7. Bakers' work table, hardwood, with space for 3 dolly mounted flour, batter, and dough tubs underneath
8. Two proofing cabinets, 110V operated, 28" x 30" x 6' high, caster mounted

9. Convection stack oven, natural gas, 48" x 48" x 30" deep
10. Combination roasting broiling oven, natural gas, 48" x 34" x 30" deep, under a divided top range, with four large open burners and a 24" x 30" cast iron grill surface
11. Meat cutting block, 36" x 36" x 38"
12. Vertical meat and bone cutting band saw, 220V, with safety blade shield, sliding feed table and knee switch
13. Meat trimming table, 28" x 48" x 38", hardwood top, with tool and utensil rack above and three meat and trim tubs on dollies underneath
14. Icing, sauce, and condiment work table, 30" x 72" x 34" with tool and utensil storage drawers underneath and overhead utensil rack
15. Utensil rack cart with shelves, brackets, and hooks for storing cleaned drums, kettles, boilers, pans, etc., 72" x 60" x 40" wide
16. Soiled dish conveyor belt, 220V operated, with overhead bar switch
17. Stainless steel scraping and rinsing table, 26" x 48" x 36", with garbage port, and dolly mounted garbage cannister underneath
18. Automatic feed through dish washer-drier, 220V
19. Dish racking drain board, 36" x 48" x 36" high
20. Dish racks and dollies
21. Tray dollies
22. Large first-aid cabinet
23. Fire extinguishers of specific types for electrical, fat, and dry fuel fire control
24. Large double tub, stainless steel pot and pan sink with double drain boards

E. Food storage zone
1. Frozen food storage, 200 sq. ft., 220V operated, with meat rails and hooks, removable ventilated stainless steel shelf sections and removable slatted floor boards
2. Cold food and produce storage, 220 sq. ft., 220V operated, with ventilated stainless steel shelf sections and removable slatted floor boards
3. Dry storage, 250 sq. ft., with adjustable shelving for dry and canned goods.

F. Fountain and short order service
1. Fountain bar and double tub sink
2. Ice cream drum unit with removable accordion top, with a capacity for six 50 lb. ice cream drums
3. Counter height cast iron fry grill, 26" x 36", with refrigerated underneath storage for meats and produce
4. Top loading dairy products chest, 28" x 36" x 36"
5. Refrigerator for syrups, batters, and extra produce storage
6. Back bar service and storage for glasses, silver, cups, general china, mixers, and utensils
7. Service counter with ten stools centered at 20" apart
8. Four service booths approximately 5' deep by 6' wide
9. Cash register

G. Garbage service
1. Eight dollies, 54" x 26" x8", to contain two each standard 26" x 36" garbage canisters

2. Garbage canister storage rack, 12' x 6' x 30" wide
3. Canister scrubbing hydrant with water pressure operated brush

H. Culinary arts classroom
1. Eight trapezoid topped tables, with three sides 30" and the fourth side 60"
2. Twenty-four stacking type student chairs
3. Teacher demonstration table, 30" x 60" x34"
4. Overhead, anti-keystone mounted, rolldown projector screen
5. Three marking or chalk boardspanels, 4' x 8'
6. Vinyl texture tack board, 4' x 8'
7. Projector table with the following projectors
   a. Overhead projector
   b. Combination slide and film strip projector with sound table
   c. Sound track film projector, 16mm
8. Six wall shelf book stack units, 3' x 5' x 10" deep

I. Dressing rooms and restrooms
1. Culinary arts students' dressing rooms; one male, one female,
   a. Twelve wall lockers for storing street clothes during instruction sessions
   b. Two lavatories with liquid soap dispenser, paper towel dispenser, and wall mirror
   c. Two toilets
   d. A urinal is required in the men's restroom
   e. A sanitary disposal unit is required in the women's restroom
2. General restrooms
   a. Men's restroom
      1) Three lavatories with soap and towel dispensers
      2) Two toilets
      3) Two urinals
   b. Women's restroom
      1) Three lavatories with soap and towel dispensers
      2) Sanitary disposal unit

J. Food service office
1. Locking executive desk
2. Executive desk chair
3. Two heavy duty, locking, steel file cabinets
4. Secretary's desk
5. Secretary's chair
6. Work table
7. Duplicator
8. Typewriter
9. Telephone connected to the outside through the central switchboard
10. Three conference chairs

K. Furniture storage

Open space for the storage of furniture that is required for conducting classes in the subdivided cafeteria areas are to be stored here. A folding stage should be provided to permit large group instruction, or provide staging for graduation exercises, or as a stage for a musical presentations at school social functions.

L. Visual Environment

A. Lighting
1. Natural lighting should be eliminated in the cafeteria because of the use of the wall space for fold away table

storage. The use of loft windows or sky lights would create problems of cleaning and controlling natural light and solar heating in relationship to the conduct of the classes in the three subdivisible spaces of the cafeteria.

2. Natural light would be acceptable in the following spaces:
   a. Food service office
   b. Teachers' dining room
   c. Fountain
   d. Wash rooms
3. Artificial light should be provided in the designated areas according to the specified sources and intensities.
   a. The cafeteria dining area requires:
      1) Overhead, diffused, sealed fluorescent fixtures
      2) Intensity: 40 ft. candles measured 30" from the floor
      3) Lighting control panels for dimming in each subdivided area
   b. Teachers' dining area
      1) Overhead, diffused fluorescent units, flush with the ceiling
      2) Intensity: 30 ft. candles
   c. Food serving line:
      Should be sufficiently lighted from kitchen fixtures
   d. Food preparation
      1) Overhead, sealed, diffused fixtures flush with the ceiling
      2) Intensity: 50 ft. candles
   e. Food storage
      1) Incandescent fixtures designed to melt special thermal requirements
   f. Fountain and short order
      1) Overhead, sealed, diffused fluorescent fixtures set flush with the ceiling
      2) Intensity: 30 ft. candles
   g. Garbage service
      1) Overhead, sealed, fluorescent units flush with the ceiling
      2) Intensity: 30 ft. candles
   h. Classroom
      1) Overhead, sealed, diffused fluorescent units set flush with the ceiling
      2) Intensity: 40 ft. candles
   i. Restrooms and wash rooms
      1) Overhead, diffused fluorescent fixtures
      2) Intensity: 30 ft. candles, adequate for personal grooming effectiveness
   j. Food service office
      1) Overhead, sealed, diffused fluorescent units set flush with the ceiling
      2) Intensity: 40 ft candles
   k. Furniture storage room
      1) Incandescent lights adequate for the safe storage and movement of furniture dollies

B. Colors, finishes, and dividing surfaces
   1. The colors in the cafeteria dining spaces should be fresh and lively, although not gaudy. The variety of uses to

which these spaces will be put should indicate the colors, although the ceiling should offer maximum light reflection without the glare of a glossy surface. The finish materials should be durable and easily cleaned.

2. The teachers' dining area should be finished in colors that contribute to relaxation, but harmonious with the furniture and floor finish.
3. The panels that separate the food service counter from the cafeteria space should be of light color paneling, and the drop panels should serve as marking boards.
4. The kitchen or food preparation area should be finished with a non-porous surface that is bright in hue and very resistant to grease, abrasion, and repeated cleaning. Epoxy paints offer such a surface and are more economical than tile, especially when space flexibility is considered.
5. Food storage units should be finished with a durable, non-porous material that is very resistant to cold, moisture, and abrasion and of the highest possible themal resistance.
6. The fountain and short order unit should be finished in bright and gay colors that offer a relief from classroom neutral tones. The texture should be durable, scuff, and stain resistant, and easily cleaned.
7. The garbage service room should be surfaced with a material that is non-porous, highly resistant to impact, scuffing, spraying with insecticides, disinfectants, and hot water.
8. The classroom should be finished in non-glossy textured materials that provide a minimum reflective capacity of 80% on the ceiling and 70% on the walls. Desk and table tops should provide a maximum reflective factor of 35%. The colors should be suggestive of cleanliness and efficiency but not sterile or bleak.
9. The dressing rooms and restrooms should be finished with mar-proof materials that resist marking, staining, and scratching and provide easily cleaned and sanitary surfaces.
10. The food service office should be finished with flat or non-glossy painted surfaces that suggest a business-like atmonsphere. The colors should be compatible with the furniture and floor covering decor.
11. The furniture storage room should be constructed of quite durable materials that will be highly impact resistant. They should be bright to provide maximum utilization of the illumination source.
12. The wall that divides the classroom from the food preparation space should have some glass treatment to permit the instructors to maintain visual contact with both areas from either area.
13. The fountain and short order space should have an appropriate amount of glass treatment on both the outer and corridor wall to be inviting without making it a showcase.
14. Wherever architecturally feasible, the dividing walls should be of temporary or non-bearing structure to permit the greatest amount of space flexibility for the anticipated expansion of this facility due to increasing enrollment expectations.

IV. Thermal Environment

A. Heating, cooling, and ventilating

1. The cafeteria dining spaces should be provided with key-

operated adjustable heating and cooling controls to provide the most appropriate temperatures for eating or learning comfort.. Ventilation should be provided at a rate of 45cfm for each subdivided area and should process the ventilated air through an adequate filtering process to remove food odors that would be disturbing to class work.

2. The teachers' dining area heating and cooling should be regulated by key-operated thermal controls. The ventilation rate for this space should be 30 cfm.
3. The foods preparation and serving area should be regulated from key-operated thermal controls. Special ventilation is required to compensate for the effect of heat and vapor exhaust hoods that are provided for all heat, steam and vapor generating items in the area.
4. The food storage units will require their own separate thermal control units and regulators, except for the pantry or dry storage. The need for maintaining humidity control, in the dry storage room is evident; consequently, separate controls from the kitchen are required. Filtered and purified air should be provided for this space.
5. Fountain and short order facillties should be provided with key-operated heating and cooling regulation. An exhaust hood should be provided over the grill.
6. The garbage service room should be provided with a stack vented exhaust system and a cooled air delivery at a rate of 45 cfm to maintain cool temperatures and retard garbage odors. All entrances should be equipped with insect proof screen doors.
7. The classroom should be equipped with key-operated, adjustable heating and cooling regulation. Ventilation should be provided at a rate of 40 cfm for this volume of space.
8. The dressing rooms, restrooms, and furniture storage rooms should be provided with fixed thermal regulation for heating and cooling services. The ventilation rate should be at 35 cfm for these spaces.
9. Food service office regulation should be provided for by hand operated controls; ventilation for this space should be a minimum of 30 cfm.

B. Acoustical

1. The cafeteria dining areas should receive acoustical treatment on the ceiling and side walls down to the top of the door frames or folding table recesses to minimize both dining and classroom noise. The floor should be treated with carpeting, unless student dances are to be considered as a part of the total program of the center.
2. The teachers' dining area should have acoustical tile on the ceiling and carpeting on the floor for both acoustical and sanitation considerations.
3. The food preparations area should have acoustical treatment the ceilings and surface irregularities to break up and reduce the noise of utensils, tools, and operating equipment. The maintenace of effective oral communication in this laboratory situation is critical to the attentiveness and learning rate of the students. The floors must necessarily be non-porous resilient synthetic that lends itself to mopping and flushing and resists grease and stains.

Floor drains with settling bowls should be provided in several zones.

5. The fountain and short order shop should receive acoustical tile treatment on the ceiling and carpeting of the indoor-outdoor quality to maintain maximum acoustical control, comfort and sanitation.
6. The garbage service room should not have acoustical treatment. The floors should be treated with non-porous, resilient, seamless, synthetic material and equipped with a fine mesh grid drain to permit frequent hot flushing of racks, dollies, and floors.
7. The classroom should reqeive acoustical treatment of both the ceiling and the floor.
8. The dressing rooms and the restrooms should have acoustically treated ceilings and non-porous slide resistant floor surfaces.
9. The food service office should have acoustical application to both ceiling and floor.

V. Utilities

The most critical consideration for the distribution of the utilities services to the culinary arts complex is that of flexibility of space. The financial expediency of poured concrete floors frequently incurs the permanent setting of utilities outlet ports in concrete; thus making expansion remodeling costs extremely high. An overhead delivery system for water, gas, electricity, and occasionally compressed air has been found most adaptable to space flexibility. Vertical drops through temporary walls or even suspended stanchions is many times most appropriate and frequently decorative.

A. Electricity

1. Cafeteria dining area

   Wall outlets for 110V current should be provided in four cluster groups between folding table recesses. The convertable use of this space to classroom and study situations should permit the use of many learning appliances including closed circuit educational TV. Outlet jacks for a built in TV circuit should be provided for this space. The water service fountain requires 110V current to chill the water.
2. The teachers' dining area should be provided with wall outlets at baseboard height to provide for such items as an electric clock, coin-operated phonograph, or decorative lamps. Outlets at 8 ft. intervals should permit adequate decoration and custodial service.
3. Food service line

   The main steam table should be provided with 220V current to maintain hot food temperatures.

   The dairy case, chill table, warm and chill food storage cabinets, and the cash register require 110V power supply. These outlets should be provided along the kitchen side of the low wall that divides the food service line from the cafeteria dining areas.
4. Food preparation area

   Electric current of 220V, three phase category, is required at the following equipment items:

a. Meat and bone cutting band saw
b. Potato peeler
c. Mixer-blender
d. Automatic dishwasher
e. A heavy duty industrial garbage disposal unit may be acceptable to the municipal sewer code and facilities.

Current supply of 110V should be provided in clusters at all ceiling drops and at left intervals on exposed walls, and situated not lower than 40" from the floor.

5. Food storage units should be provided with the current required by the refrigerator unit installed in that space.
6. The fountain and short order space should be provided with numerous cluster outlets to supply 110V power to the refrigerator, ice cream service unit, mixers, beverage disposers, toasters, etc., and to a coin operated phonograph in the customer seating area.
7. Garbage service requires sealed 220V power at the garbage can scrubbing hydrant. A moisture proof wall switch should be provided at least 40" above the floor as a safety measure.
8. The classroom requires 110V outlets at 4 feet intervals along the baseboard of the wall behind the instructor's station and at 10 foot intervals around the room.
9. The dressing rooms should be provided with outlets for 110V power on both sides of the wall mirrors above the lavatories.
10. Food service office activities require 110V outlets at baseboard level at 8 feet intervals around the rooms to operate adding machines, typewriters, etc.

B. Water

1. The cafeteria dining space water service fountain requires a cold water supply.
2. The water service fountain in the teachers' dining room requires a cold water supply.
3. The food preparation area requires both hot and cold water at the following locations:
   a. Vegetable sink
   b. Potato peeler
   c. Soiled dish rinse table
   d. Dish washer
   e. Pot and pan sink
   f. Two appropriately located wall mounted mixing bibs for flushing floors and extra water supply.
   g. Steam jacketed kettle.
4. The fountain counter requires both hot and cold water at the double tub sink and cold water at the fountain faucet for chilled water.
5. The garbage service room requires both hot and cold water at the scrubbing hydrant and at a mixing bib for flushing the floor.
6. The dressing rooms and restrooms require both hot and cold water at the lavatories and cold water at the toilets and disposal.

C. Natural gas

The delivery of natural gas from ceiling drop stations to the following pieces of equipment should be provided, and equipped

with both manual sheet of valves and electrically operated thermo couple relays.

1. French fry well
2. Cast iron top range
3. Convection stack oven
4. Combination roasting oven anddivided top range
5. Gas fired incinerator located outside of and slightly separated from the building

D. Steam

High pressure live steam should be supplied to the tilt type steam jacketed kettle.

VI. Special Considerations

Color coding should be provided throughout the food preparation area to maintain maximum attention to safety practices for activities in that area.

Precaution should be taken wherever possible to prevent or reduce the admittance of insects into the culinary arts complex.

GREAT FALLS VOCATIONAL-TECHNICAL CENTER

Trades and Industry

I. Introduction

The concept of the trades and industry division of the vocational-technical center is not a new one. Some states, such as Nebraska, have operated trade schools for as long as twenty years. Some private schools that instruct students of post high school and adult level have operated much longer.

The major problems facing many of those institutions has been updating equipment in relationship to new technology. The specific difficulty centers around finances for structural remodeling and expansion in conjunction with the procurement of the required equipment and qualified instructors. Other problems that relate such schools to the industrial world are labor union and employer public relations and resulting placement problems for their graduates.

Consequently, to permit the most appropriate organizational structure of the Great Falls Vocational-Technical Center, the quasi-separation of the building trades from the industrial trades seems most reasonable as an indirect means of securing the cooperative efforts of the labor unions through which most of the graduates of this department will be certified and employed.

A specified portion of the training of students who reqeive instruction in the trades and industries will take place under the direct supervision of union journeymen on contract jobs. That situation is particularly true of plasterers, masons, and glaziers. It is therefore considered most appropriate that they be housed, for both classroom and the limited amount of laboratory work required, with the carpenters and cabinet makers in the building trades division of the instructional department.

II. Introduction Summary

The obvious interrlationship of the courses of study identified above indicates the need for sharing of facilities. For example, the usability of welding in plumbing, automotive, electronics, sheet metal, and machine shop work identifies some of the needs for interdisciplinary scheduling.

Scheduling practices can, when accompanied by the application of some of the specified observable educational trends, accomplish the understanding of the total society as a particular team, the members of which are all working toward some commone goal.

GREAT FALLS VOCATIONAL-TECHNICAL CENTER
Building Custodian Training Program

I. Introduction

The building construction business has made a significant contribution to the economic growth of this nation, and will continue to do so. New buildings such as schools, apartment buildings, and office buildings are being erected at an unprecedented rate. Hundreds of millions of dollars on investments are represented in these facilities. It is important that these investments be protected through proper maintenance, repair, and service that will prolong their usefulness to the maximum. Competent building custodians are needed to service these buildings.

The growing demand for new workers in the building maintenance field and the need to acquaint those already employed in the occupation with new materials, new equipment, and new techniques suggests the need for an organized and systematic approach to the preparation of new workers and the upgrading of the experienced ones.

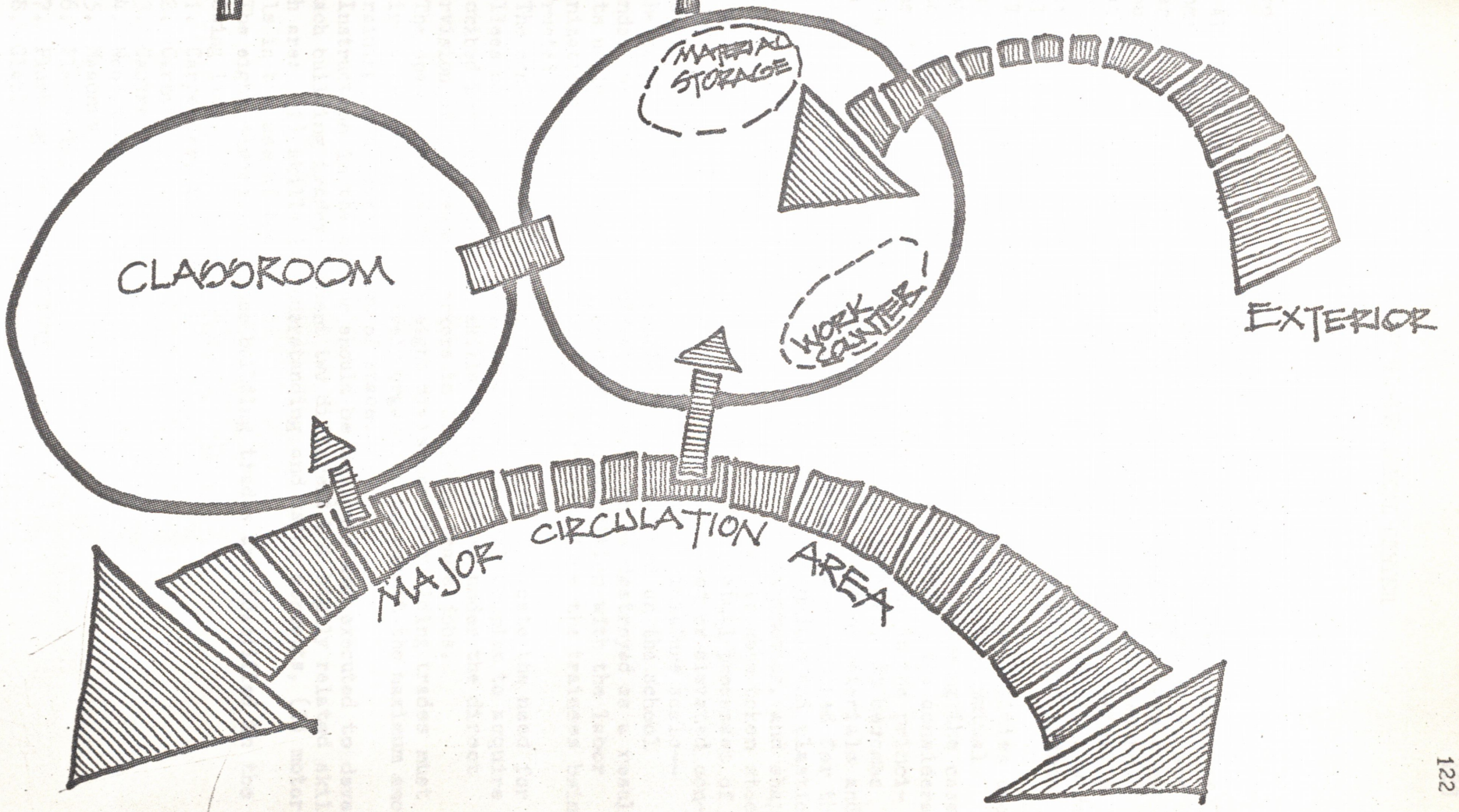
II. Description of Facilities

The school plant in which the training program is conducted should be utilized as a laboratory for practical work assignments, in conjunction with the related instruction as an integral part of the sixty clock hour program. Not only would such an arrangement contribute to the care and maintenance of the school at no cost, but it would also preclude the necessity of developing simulated and costly facilities and situations for student application and performances.

The classroom for related instruction could be any space in the school adequately heated, lighted, and ventilated which provides a minimum of sixty square feet per student for a maximum class size of twenty. A flexible table and chair seating arrangement should be provided and should afford an unobstructed view of the instructor and the demonstration area. No special facilities are required in the related instruction area if the facilities of the school plant or institution are available for practical work assignments and general instructional demonstration purposes.

No extra room or space is required for the instructional space if another classroom can be used that is at least 1200 sq. ft. and has the custodian storage area adjacent to it.

CUSTODIAL TRAINING.



GREAT FALLS VOCATIONAL-TECHNICAL CENTER

Building Trades

I. Introduction

All eight divisions of the building trades have been objects of change in the development of new or modified methods, concepts, and materials. Metals, synthetics, and new forms of ceramics have contributed to such concepts as interiors and exteriors that need no repainting, floor surfaces and coverings that are nearly chemically inert, and modular prefabricated units and systems that permit a wide variety of structural design in residential, commercial, and industrial units.

The interdependence of the eight building trades specialities upon each other in promoting individual advantage requires that mutual benefit become the focal point of their efforts. Such being the case in the employment world, it is even more appropriate in the considerations of a school that endeavors to instruct students in the principles and some of the skills of those trade specialties. It becomes even more necessary when the tremendously wide range of materials and related techniques are considered. The storage space required for the many varieties of interior trim such as extruded aluminum and plastics, open face and glazed ceramics, molded metals and synthetics, and shaped wood trims would tend to limit the quantity stored to mere token stock. In the consideration of space and equipment, the actual processes of building forms, pouring concrete, and raising tilted or elevated concrete slabs could not be accomplished--except in miniature scale--in the school building, and should it be attempted on the school grounds, the end product would either have to be destroyed as a result of its uselessness or be disposed of in competition with the labor organizations that must ultimately roster and place the trainees being instructed in the center.

The conditions just cited, plus many more, indicate the need for enrollees of the Great Falls Vocational-Technical Complex to acquire prescribed portions of their skills to be learned under the direct supervision of journeymen workers in building trade jobs.

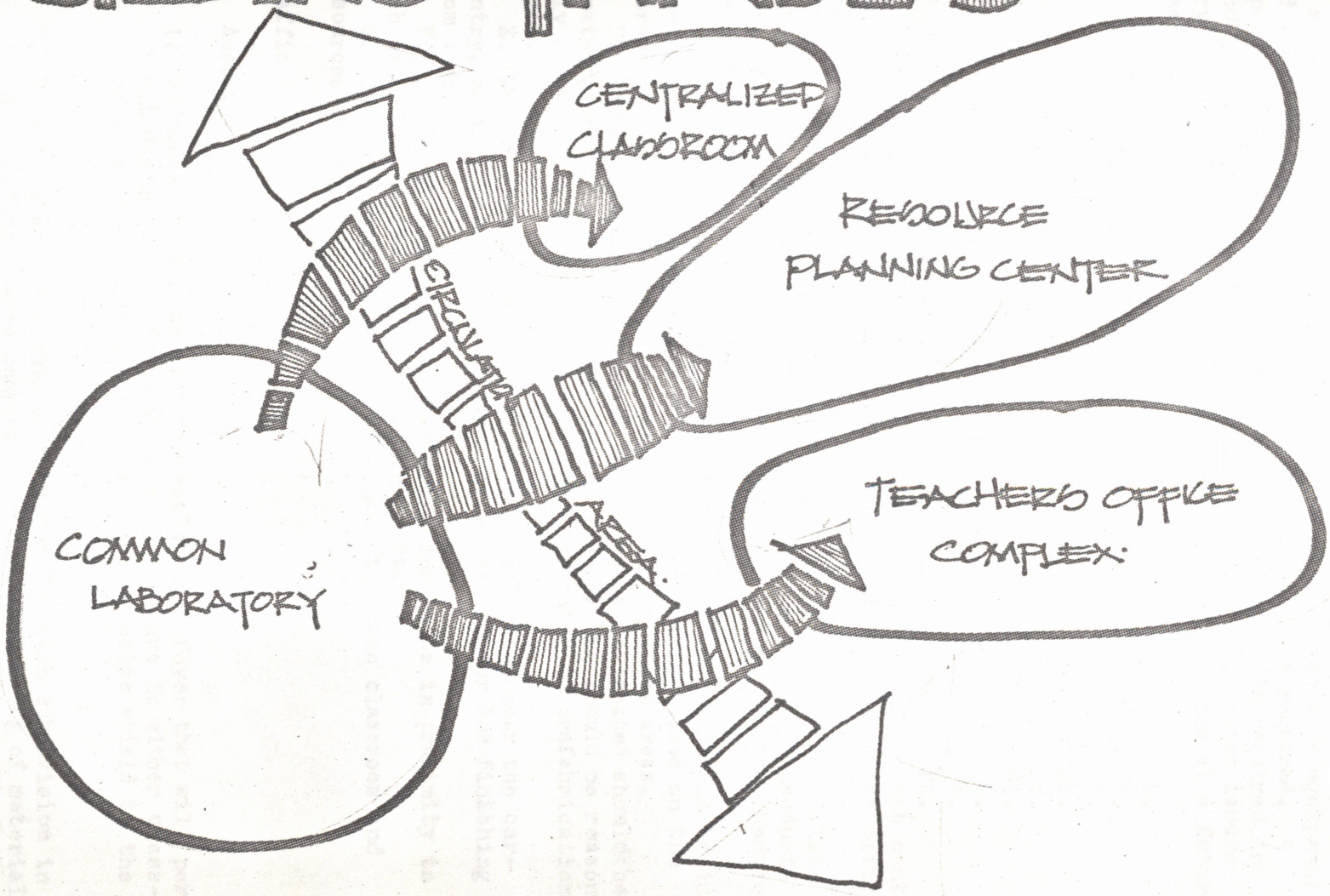
The space devoted to the eight divisions of building trades must be highly related and effectively organized to permit the maximum amount of training in a given amount of space.

Instruction in the center should be designed and executed to develop in each building trades student two different but highly related skills which are: (1) skills in understanding and using concepts, (2) motor skills in the use of tools.

The eight divisions of the building trades are identified in the following list.

1. Carpentry, framing
2. Carpentry, commercial
3. Cabiner making
4. Wood technology
5. Masonry
6. Plastering
7. Plumbing and pipefitting
8. Glazing

BUILDING TRADES



II. Space Relationships

The need for coordinated instruction in the application of some of the major basic concepts of the building trades requires the provision of a large common work area surrounded by specialized work equipment and furniture zones for learning the specific skills required. A separate area for the specific laboratory equipment is required for wood technology. Some space in the perimeter of the common laboratory area should be left to include electricians training at a future time.

A. Common laboratory space: Approximately 1200 sq. ft.
B. Specialized skills areas: .....3600 sq. ft.
   1. Carpentry . . . . . 450 sq. ft.
   2. Cabinet making . . . . . 600 sq. ft.
   3. Masonry . . . . . 450 sq. ft.
   4. Plastering . . . . . 450 sq. ft.
   5. Plumbing . . . . . 600 sq. ft.
   6. Glazing . . . . . 600 sq. ft.
   7. Wood technology . . . . . 450 sq. ft.

The common laboratory space should be situated close to the centralized classroom, the resource-planning center, and the teachers office complex.

The skills of pre-casting, pre-stressing, tilt and raised slab techniques involve such equipment, space, and indisposable products as to be unfeasible as a laboratory operation and should be scheduled for on-the-job journeyman supervised training.

C. Some of the specialized skills areas designated should be identified as materials storage with strong emphasis being placed on the storage of plumbing and glazing materials within those areas.

D. The cabinet making special skills areas designated should be located closest to the finishing rooms, and glazing should be reasonably close to permit the basic and final finishing of prefabrication items.

E. Wood technology activities should be located near the carpentry, cabinet making, and glaziers areas and border the finishing room also.

F. Plumbing, masonry, and plastering should be in proximity to each other around the common laboratory area.

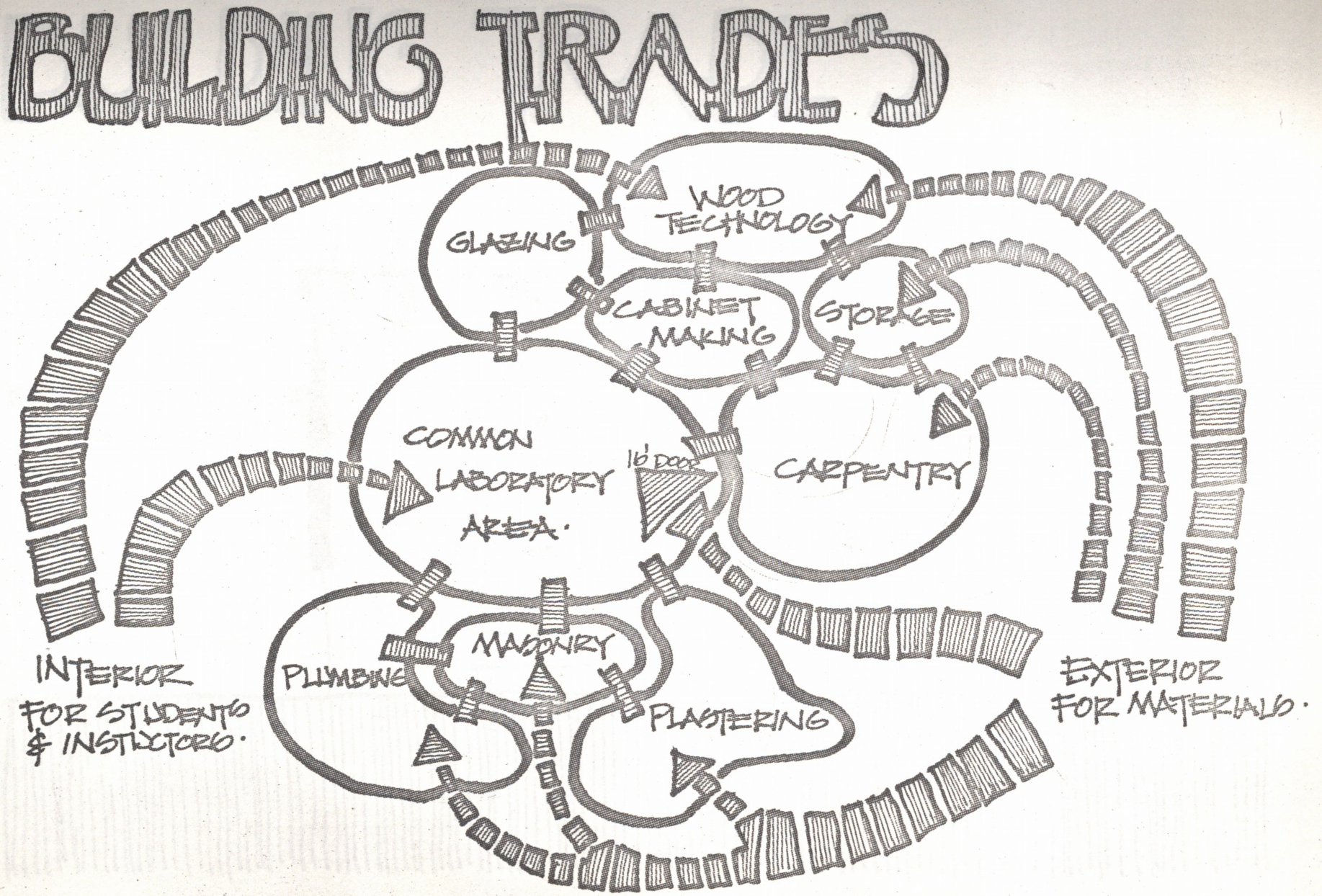
G. The whole complex should be adjacent to the classroom and resources center.

III. Traffic

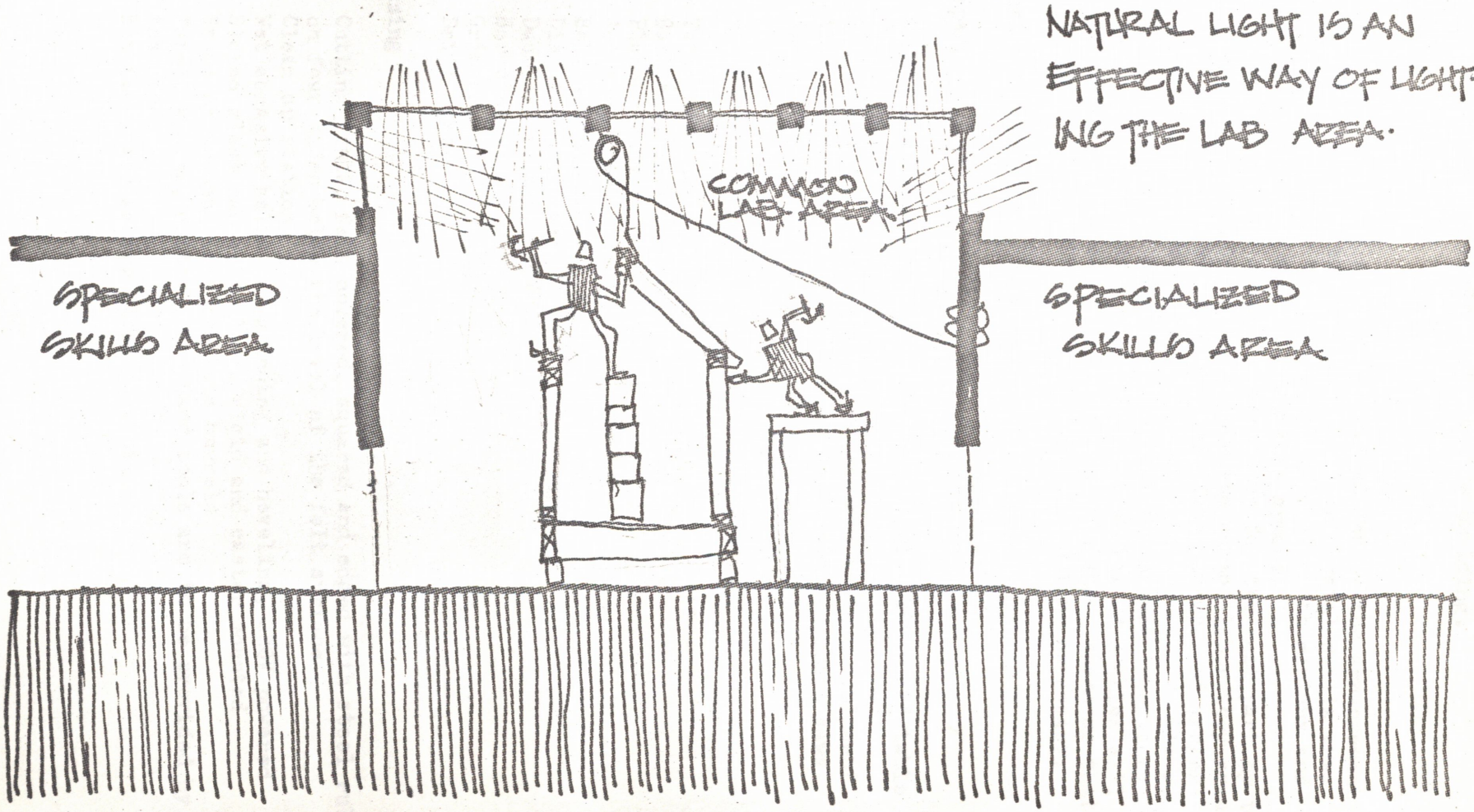
A. Access

1. Personnel access is most desirable via a foyer that will permit distribution of student and instructors to either classroom or laboratory areas and serve as a noise shield to the classrooms.

2. Materials access should be provided for each subdivision in the building trades complex to minimize handling of materials. A service driveway is, therefore, required all the way around the building to provide the necessary access. The service drive


BUILDING TRADES
GLAZING
WOOD TECHNOLOGY
CABINET MAKING
STORAGE
COMMON LABORATORY AREA.
16' DOOR
CARPENTRY
MASONRY
PLUMBING
PLASTERING
INTERIOR FOR STUDENTS & INSTRUCTORS.
EXTERIOR FOR MATERIALS.

BULDING TRADES



should be constructed slightly above grade to permit drainage of the asphalt surface away from the building.

B. Internal

1. Personnel traffic should be provided for by the arrangement of furniture and equipment within each special skills area of the laboratory to permit aisles of 6' width minimum and provide access to materials storage spaces.
2. Materials traffic should be permitted for the most part by the six foot aisles for movement into the common laboratory area from the specialized skills zones. The movement of larger prefabricated modules should be moved to the outside via a 14' wide overhead door at one end of the common laboratory space. It is assumed that large prefabricated modules will not require processing in any of the finishing rooms so that provision for their movement there will not be necessary.

IV. Furniture and Equipment

A. Carpentry I and II

1. Radial arm saw for vut off operations, with 20" x 12' table
2. Clean up station
3. Saw horses and work benches are required as shop equipment
4. Students will be required to provide their own skill saws and other hand tools

B. Cabinet making

1. Table saw, 220V
2. Band saw, 220V
3. Planer, 220V
4. Jointer, 220V
5. Belt sander, 220V
6. Disc sander, 110V
7. Dado and router, 220V
8. Bar clamps.
9. Grinder, 110V
10. Drill press

C. Glazing

1. Cutting table, felt covered, squared and edged with steel rules on four sides below thellevel of the felt surface
2. Clean up station
3. Wet abrasive belts for grinding and beveling, 220V powered
4. Sloped glass racks, 8' long, rigid and caster mounted
5. Steel or wooden glass breakage barrels
6. Tapes, knives, cutters, and hand tools are to be provided by the student
7. Hot tanks for safety glass cutting.

D. Plumbing

1. Combination machine, pipe cutter, reamer, and threader with dies and taps
2. Work benches
3. Cutting troughs for soil pipes
4. Grinder
5. Clean up station
6. Hand tools such as wrenches, asbestos bouring ropes, caulking irons, and hammer to be provided by the student
7. Welding and soldering applications

E. Masonry

1. Brick and tile pallets, mounted on casters, 3' x 3'
2. Cutting tables
3. Stone chisels
4. Wet reservoir tile saw, 220V
5. Small electric powered mixer
6. Hand tools such as brick and block chisels, trowels, skutches, and breaking hammers to be provided by the students.
7. Wet disc power tile cutter, 110V

F. Plastering

1. Small volume electric powered mixer
2. Pallets, mounted on casters, 3' x 3'
3. Clean up station
4. Hand tools such as hawls, trowels, and brushes to be provided by the student

G. Wood Technology

A list of laboratory equipment is required for this department.

V. Thermal Environment

A. Adjustable thermal controls should be provided for the large open space that contains both the specialized skills zones and the common laboratory space. The source of heat should be provided by hot water pipes in the concrete floor.

B. The cooling system should operate from the same adjustable controls that regulate the heat. A cupola cooling unit can best provide cool air distribution to the enclosed space and permit the greatest flexibility of space utilization over a period of time.

C. Ventilation can best be provided in this complex by the operation of an efficient dust accumulation system. The 75,000 cu. ft. of space can be completely exchanged in a 30 minute period by the 2500 cfm dust accumulation system by drawing air through the uncooled cupola filter system.

VI. Visual Environment

A. Illumination

1. The need for 12' ceilings to permit vertical storage of many

long materials will require a well-diffused lighting system of overhead fluorescent fixtures set flush with the ceiling and sealed against dust and vapors of the shop.

2. The lighting intensity should be 50 ft. candles, measured 30" from the floor.

3. The controls for the lighting circuits for each specialized skills area should be in close relationship to the power control panel that regulates high voltage supply to the power equipment.

4. Natural lighting is also desirable over the common laboratory area.

B. Acoustics

The ceiling, which should be no less than 16 ft. high, should be finished with maximum rating acoustical materials.

C. Colors and finishes

1. The colors should generally be light in hue and provide a minimum of 75% reflective factor.

2. The finishes should be durable and resist scratching, chipping, and abrasion from frequent washing. A non-gloss or flat finish on smooth surfaces is recommended.

VII. Utilities

A. Electricity

1. Standard 110V service should be provided to each of the specialized skills areas via a minimum of three heavy overhead ratchet rills with 40 ft. of heavy duty extension cord to permit lowering and retracting of the supply sources. Wall outlets should be provided at three foot intervals at table top level. All outlets should be properly color coded and grounded.

2. Heavy service 208V or 220V supply sources should be provided by vertical stanchions with overhead circuiting to permit maximum safety, flexibility, and maintenance. The number and location of the stanchions must be determined by the number of power equipment pieces and their location within each specialized skills area.

B. Water

1. Hot and cold water supply must be available at each of the clean-up stations which include a semi-circular sink, soap and towel dispensers, and waste receptacles. A mixing bib for hot and cold water should be provided near each clean-up station and a heavy duty hot water hose reel should be close by to permit flushing of the floors throughout the entire complex.

C. Compressed air

Each specialized skill area should be provided with a compressed air source to match each 110V overhead reel. The source should be a heavy duty air hose ratchet reel containing 40' of flexible air hose at a minimum 150 lbs. pressure to permit the cleaning of project items, power tools, and work areas at a rate of 5 cu. ft. per minute per man.

D. Sewer

Fine grid coverings for floor drains with very large settling bowls should be provided for each specialized skill zone in the space where the floors of those areas join the common laboratory space perimeter. The slope of the floors should be uniformly toward the drains. Leveling of power equipment on such floors should be permitted by leveling adjustments on the equipment itself.

The floor should be of seamless, non-porous, resilient synthetic to prevent the roughness that accompanies the use of mortar, plaster, and grouting on sealed concrete.

GREAT FALLS VOCATIONAL-TECHNICAL CENTER

Industries
Metal Working

I. Introduction

The metal working complex includes three major divisions which are machining, metallurgy, and welding. The machining section includes the following sections:

A. Lathes and milling machines
B. Metal cutting saws
C. Grinding and finishing
D. Founding, forging, and tempering

The founding and forging activities are so closely allied to both machining and metallurgy that for the purposes of instructional and space economy it is most feasible to include metallurgy into the machining department and treat it as an integral part of the machining curriculum.

However, many of the testing and analyses devices used in metallurgical study serve equally well in the testing and analysis of alumina oxide ceramics that are rapidly becoming dominant factors in both heavy industrial bearings and equipment and in jet and turbine engine manufacture. Much of the equipment required for metallurgical work is also usable in plastics analysis. The use of polystyroids, acrylics, and nylon chemical groups along with the ceramics in both instrumentation and industrial training in the testing, construction or extrusion, and machining of these highly developed materials.

Careful planning for the inclusion of instructional course work in the curriculum of the Great Falls Vocational-Technical Center should begin at once and the architectural plans for this department should provide for adequate allowances of additional space for instruction in processing, machining, and finishing of ceramics and plastics.

The welding complex contains seven area subdivisions.

1. Metals storage
2. Cutting area
3. Grinding space
4. Testing zone
5. Welding booth
6. Gas storage
7. Layout

II. Space Relationships

A. Metals

1. The external space relationships involve sharing metal stock storage space with the welding section which is immediately adjacent without any separating walls. This will provide direct access to metals students to the welding testing zone as well as to the metal stock storage.

2. An exterior access door should be provided for the metals work area to permit the receipt of deliveries of machine oils, tool pieces, etc. Access should also be provided to the corridor that leads to the resource center, classrooms, and instructors' offices.

3. The internal space relationships exist in the following descriptions.
   a. Lathes and milling machines: . . . . . .1485 sq.ft.
   b. Metal saws . . . . . 325 sq. ft.
   c. Grinding and finishing . . . . . 440 sq. ft.
   d. Founding and forging . . . . . 690 sq. ft.
   e. Metallurgy. . . . . 880 sq. ft.

   All areas indicated include the floor space required for machines, working space, and traffic aisles.

B. Welding

1. The external relationship with the metals division on one side should be established with the automotive on the other side, except that the need for dividing walls is evident by reason of the difference in materials and instructional procedures involved.

2. Access to the automotive section and to the corridor should be provided. A large overhead power operated door should be provided for the metal storage space.

3. Internal space relationships exist, as described, between the following activities zones of the welding section.
   a. Arc, mig, tig, and inert gas shield welding booths .. . . . . 275 sq. ft.
   b. Acetylene welding booths . . . . . 140 sq. ft.
   c. Structural steel practices . . . . . 135 sq. ft.
   d. Aisle space between booths . . . . . 440 sq. ft.
   e. Machine cutting zone . . . . . 435 sq. ft.
   f. metal stock storage . . . . . 720 sq. ft.
   g. Grinding . . . . . 384 sq. ft.
   h. Testing . . . . . 384 sq. ft.
   i. Two gas storage cells (outside access) . . 50 sq. ft. each

III. Traffic

A. Metals

1. The movement of personnel into the area is predominantly patterned from the classroom and the resource and planning center.

2. The movement of personnel from the metal stock to the machine and milling section will occur frequently and in patterns that relate directly to the phase of metals instruction. Most of such movement will be from the stock to the metal saws section to the machine zone.

   Movement between the machine and grinding zone or between the machines and the foundry department for tempering

or hardening of metals will occur. The aisle space required for such movement has been computed into the zone area specifications.

3. The only materials movement that involves dimensions greater than that required for personnel traffic is from the metal stock to the cutting saws, and adequate space for materials traffic has been considered.

B. Welding

1. The movement of personnel corresponds largely to the movement of most materials. However, not all work in the welding department will involve coupon work. Some projects may be larger, and larger aisles are required. The aisles around the metal stock storage section and the cutting section have been included in the space specifications as they have in the booth zone (8' aisle) and the grinding and testing zones.

IV. Furniture and Equipment

A. Metals

The lathe and machine zone should include the following machines and furnishings.

1. Lathe, 18" x 8', 220V, 3 phase
2. Lathe, 14" x 6", 220V, 3 phase
3. Four lathes, 10" x 3', 220V, 3 phase
4. Milling machine, horizontal, 220V, 3 Phase
5. Milling machine, vertical, 220V, 3 phase
6. Two electro-chemical milling machines, 220V, 3 phase
7. Tool storage panel, vertical, 8' x 6' x 18", locking
8. Chalk board, 4' x 6'

The zone for metal cutting to precise measurements should include the following items:

1. Vertical band saw, metal cutting, 220V, 3 phase
2. Horizontal band saw, metal cutting, 220V, 3 phase

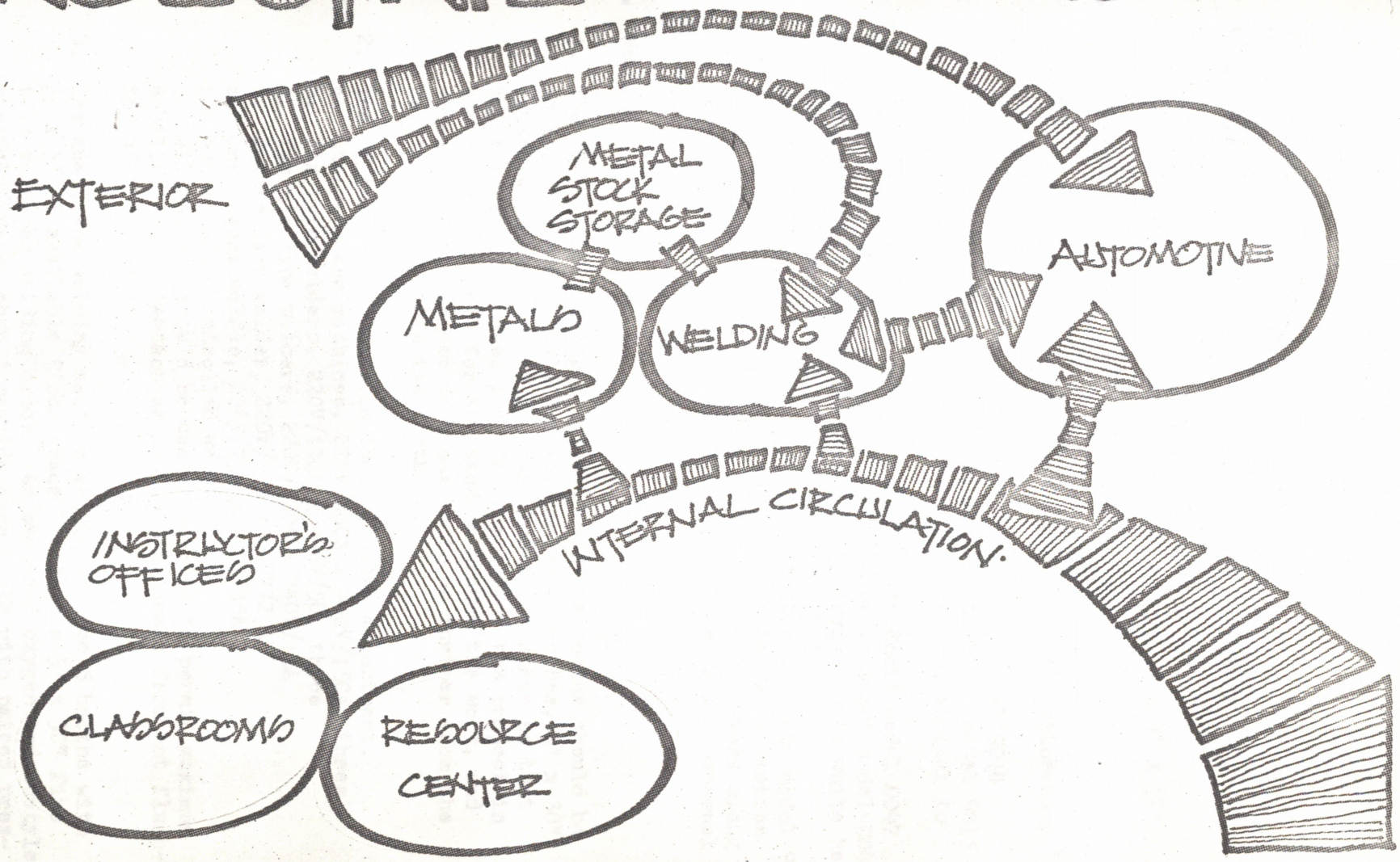
The grinding and finishing section should contain the following items:

1. Centerless grinder, 8", 220V, 3 phase
2. Surface grinder and pumice drum, 110V
3. Tool grinder and buffer with guides and clamps, 110V
4. Pedestal grinder, 110V
5. Drill press, $\frac{1}{2}$" chuck, 14" stroke, 220V, 3 phase
6. Drill press, 3/8" chuck, 10" stroke, variable speed, 110V
7. Water quench tank
8. Tool storage panel, lockable, 3' x 4' x 10"
9. Chalk board, 4' x 6'

The founding and forging zone requires the following items to permit proper learning of metal treatment operations for both metallurgy and machining curricula.

1. Annealing or tempering furnace with timing-temperature controls, gas operated, $4\frac{1}{2}$' x $5\frac{1}{2}$' x $4\frac{1}{2}$'; insulated
2. Smelting furnace, gas operated, with operable hood and rack for ceramic smelting ladles
3. Gas fired forge, 3' x 3' x 28"

INDUSTRIES • METAL WORKING •



4. Chemical quench tank, 30" x 36" x24"
5. Water quench tank, 30"x 36" x 36"
6. Mould making bench, 3' x 8' x 28"
7. Sand bin, 3' x 9' x 5', 3 compartments
8. Anvil, 150 pounds
9. Sand muller, 3' x 4' x 40"
10. Layout and testing table, 5' x 5' x 36"
11. Tool panels, lockable, with silhouette inventory
    a. Furnace tool panel, 3' x 4' x 16"
    b. Forge and anvil tool panel, 3' x 4' x 12"
    c. Moulding and pattern making tool panel, 3' x 4' x 12"

B. Metallurgy

1. Structures test system panel, similar to Scott engineering model 9004
2. Materials test system set, similar to Scott model 9014
3. Stress observation polariscope, similar to Scott model 9015
4. Measurement and statistical samples study set, similar to Scott model 9006
5. Photo elastic stress cylinder, similar to Scott model 9047
6. Mechanical loading systems press, similar to Scott model 9042
7. Metals thermal conduction system, from cryogenic to white heat thermal ratings, similar to Scott model 9051
8. Strain and stress indicator system, similar to Scott model 9083

General requirements for the metals and metallurgy section include a drinking fountain and a bank of 20 wall lockers along the corridor wall for the storage of shop clothing and personal items.

C. Welding

1. The 10 arc and inert gas shielded welding booths should be equipped with fire tile surfaced welding benches, 5' x 30", raised with the 5' x 5' of available floor space so that ample space is allowed for the location of the project in the booth, movement for the student around the work, and movement of the welder unit nearer to or further from the working space within the booth.

2. The welders should include the following assortment.
    a. Standard arc machines, 220V/300A x 440V/150A, three
    b. Tig type welders, 220V/100A x 440V/50, three
    c. Two mig type welders, 220V/130A x 440V/15A
    d. One heliarc welder, 220V/50A x 440V/25A
    e. One plasma welder, 208V/75A x 420V/35A
    f. Numerically controlled welder unit

    All welders should be caster mounted to permit maximum mobility and protection against water damage from hot flushing of the floors.

3. The acetylene welding section should include 5 booths with 5' x 5' of available floor space and have a 5' x 30" fire tile surfaced welding bench. An overhead oxygen and acetylene manifold system should provide each booth with paired pressure regulators at the connection points of the hoses.

4. Two of the acetylene booths and five of the arc booths should be provided with overhead jigs. This area should adjoin space for hot and cold riveting, punching, and drilling of structural steel. A rivet forge is required.

5. A portable quench tank should be available to the booth area.

6. The cutting zone should be supplied with the following equipment:
   a. Cutoff saws, horizontal, 16" abrasive disc, 110V
   b. Gas cutter, portable
   c. Cutting table, 26" x 14' x26"
   d. Makeup table with machined steel top, 4' x 4' x 26"

7. The metal stock storage unit should be constructed tiered "T" frames to provide access to 18' long metal stock from either side of the central vertical beam. The arms of the "T" should be no longer than 18" and spaced no further apart than 12" vertically with 5 arms including the base at floor level.
   Two racks separated by 3' of service aisle space should be constructed of 4 stanchions per row. Maximum storage of 18" long metal stock in the rack is the equivalent of 38,880 linear feet of 1" diameter metal stock or 9720 linear feet of 2" diameter metal stock for both welding and maching use.

8. The grinding area should contain the following equipment:
   a. Grinder, 2 wheels, 10", 110V
   b. Belt grinder, dry or wet, with reservoir and water supply, 6' x 6' belt, 220V, 3 phase
   c. Bench grinder and buffer, 6", 110V
   d. Filing table, 3' x 4' x 34", with vises
   e. Vise, 8" jaw, 12" throat
   f. Vise, 5" jaw, 8" throat, swivel mounted, with pressure lock base

9. The testing zone should have the following equipment:
   a. Bending jack
   b. X-ray scope, 4" face
   c. Hydraulic stress press with gauge
   d. Pneumatic hammer for impact test
   e. Wall lockers for shop clothes, wood or steel
   f. Sonic and magnaflux testing equipment

10. Gas storage
    a. Oxygen storage cell, 4 live 300# bottles and 2 spares
    b. Acetylene storage cell, 4 live 300# bottles and 2 spares
    c. Inert gas storage, 4 to 8 180# bottles
    d. Acetylene receiver manifold with 4 heads and a master regulator
    e. Oxygen receiver manifold with 4 heads and a master regulator

V. Thermal Environment

A. Metal Working

1. Heating should be provided by hot water piping inlaid in the concrete floors and regulated by key operated controls.

Heated floors provide not only the most suitable kind of shop heat for cold weather but also prevents the accumulation of moisture which creates unpleasant odors and unhealthly conditions as a result of hot flushing some shop floors.

2. Cooling and ventilating
   a. The general shop space of the metal working laboratory should be provided with cool air from an overhead or cupola unit distributed according to the heat sources within the space.
   b. Ventilation should be provided by an exhaust system with pickups centered in the founding and forging zone operable from key controls and capable of exhausting at a rate of 500 cfm, a rate that will change the air of the foundry space each 20 minutes or the metals complex in approximately 47 minutes.

3. Acoustics should be provided by the application of acoustically absorbant materials to the ceilings and, where, possible, the use of beams or drop channels to trap and break up the direct transmission of noise.

B. Welding

1. Heating should be provided by warmed floors as in the metals laboratory and regulated by key controls.

2. Cooling should be provided by a cupola system that may be served by the same unit serving the metals laboratory.

3. Ventilation should be provided by an exhaust system that has pickups at each welding booth capable of exhausting all booths of air in a 3 minute period or 1500 cfm.

VI. Visual Environment

A. Metal working

1. Lighting for this area should be provided by some controllable natural illumination and controllable artificial illumination. The windows that provide natural light should be lowered or equipped with blinds to prevent undesirable unbalanced lighting, shadows, and glare.

   The artificial lighting should be provided by overhead fluorescent fixtures set fluch with the ceiling and shielded by diffusing cover plates that are sealed against dust and fumes. The lighting intensity should be 70' candles, measured from the floor at 36".

2. The colors and finishes in the metal working section should be of light hue in a durable moisture and stain resistant quality of a flat or non-glossy finish. The ceiling paint should possess a minimum reflective property of no less than 85% and the walls no less than 75%. Synthetic resins or epoxy materials are recommended for the walls.

B. Welding

1. The lighting for this section should be supplied completely by artificial sources. Windows would permit flashes of arc and acetylene torches to effect the natural lighting sources of other departments in surrounding buildings.

The artificial lighting should be provided by overhead fluorescent fixtures that are sealed by diffuser plates and illuminate the area of 70' candles, measured 36" from the floor.

Special lighting is required in the welding stalls in the form of a 110V adjustable fixture that is wired for a high intensity lamp. The adjustable fixture should be situated in the welding booth so that it will illuminate the work either on the table or in the overhead jig from a position between the worker and the project. This is necessary because the welding hood has a very dark optic plate and because direct lighting should not enter the hood or mask from the rear.

VII. Special Requirements

A. Floors

Drainage patterns to grid covered drains equipped with either small sumps or large settling bowls should be provided in both sections. The open or uncovered protions of the cement floor should be smoothed, etched, and sealed. Heat pipes, floor drains, and hot and cold water service should be the only utilities provided through the floors.

GREAT FALLS VOCATIONAL-TECHNICAL CENTER

Industries
Automotive

I. Introduction

Recent social problems arising out of the by-products from the conventional internal combustion automobile engines have brought into focus the possibilities of other forms of motive power, including the turbine, the electric car, and steam engines, both piston and turbine. As a consequent consideration, the space required for this section of industrial technical training should be designed with maximum flexibility and be so situated as to allow the enclosure of additional space for expansion into various sub-fields of automotive power modes as they develop into industrially efficient units.

To provide maximum area flexibility, all utilities services, except heat and drainage should be provided by overhead service trunks, with appropriate shut-off controls at a master control panel within the section area to maximize flexibility, safety, and economy.

II. Space Relationships

A. External

1. Access to parking space for three or four vehicles should be provided so that projects waiting for work, or those which are completed and are waiting to be recovered by their owners, can be stored in an enclosure designed to minimize theft and vandalism.

2. The exterior wall of the shop laboratory should be so designed as to permit extension of the laboratory area to include new space as changes in the automotive industry occur.

3. The automotive laboratory should be adjacent to the finishing rooms, both wet and dry, that are provided for the building trades.

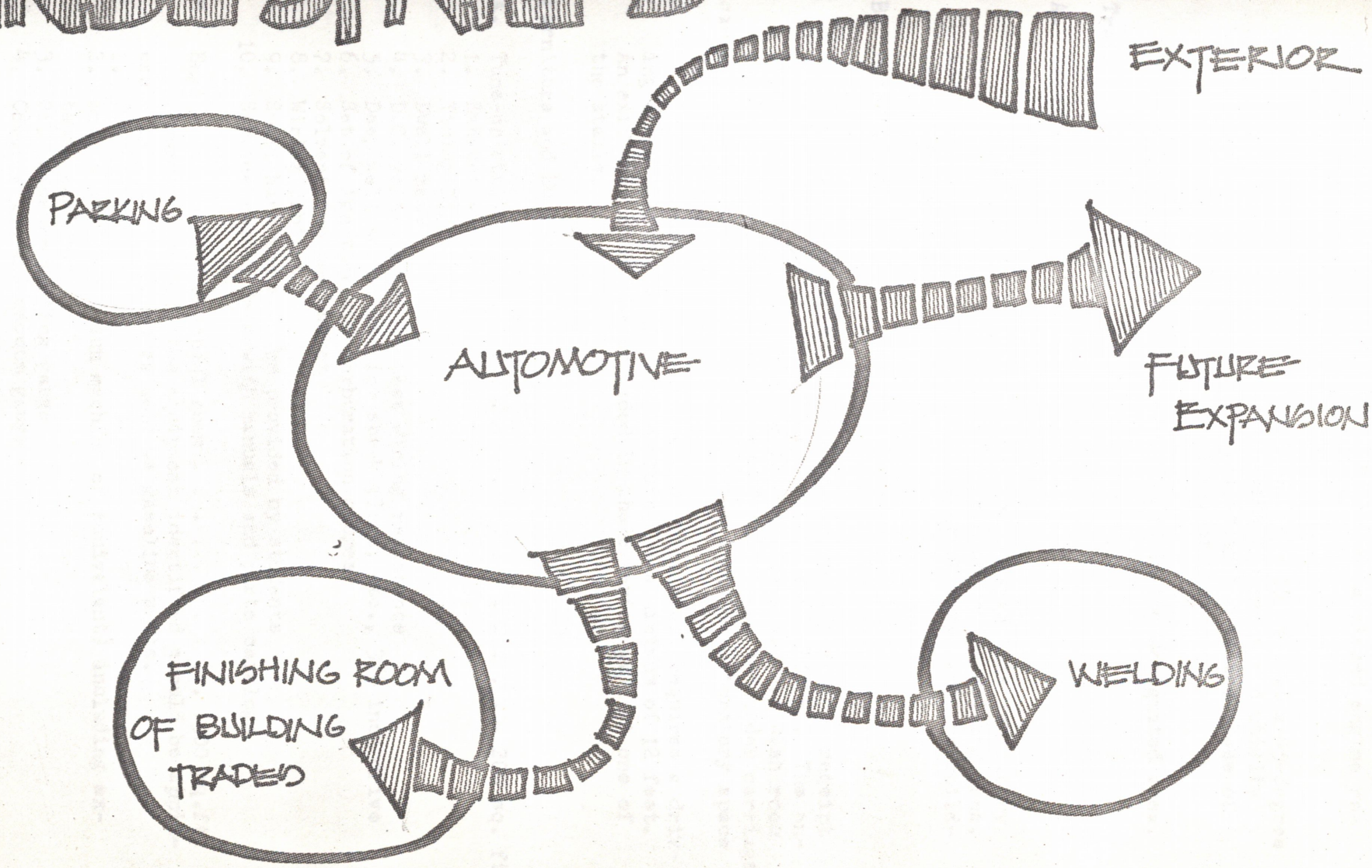
4. The welding department should be adjacent to the automotive section so that the metal stock and welding gas are within reasonable distance.

5. Access to the corridor that leads to the resource and planning center, the classrooms, and the offices should be available from the automotive laboratory space.

B. Internal

1. The minimum total area required for a seven-stall shop is 3750 sq. ft. This amount of space must include a steam and

INDUSTRIES • AUTOMOTIVE



wash station, and a closed infrared finishing room, a storage space for parts and tools, an instructor's station, a closed body and welding station, and a closed engine rebuilding and testing room.

2. Seven car stalls, approximately 10' x 15' set at a 45-degree diagonal to the walls will provide equipment and utility space at the front of each area according to the phase of instruction assigned to the stall or room.

3. A clean-up station must be included in the designated area.

III. Traffic

A. Personnel

Entrance and exit must be provided between this laboratory space and the classroom complex as well as to the welding area, the finishing rooms that adjoin this laboratory, and the building trades complex.

B. Materials

Access must also be provided to the outside so that receipt of parts, materials, and equipment can be accomplished. The entrance of any vehicle should be through the steam and wash room so that a thorough steam cleaning of the engine and under carriage can be accomplished prior to moving it into the laboratory space for further work.

The movement of a machine to a service stall requires a driving aisle preferably 15 feet in width, or a minimum of 12 feet. An exit door should be provided in the exterior wall at one of the stalls.

IV. Furniture and Equipment

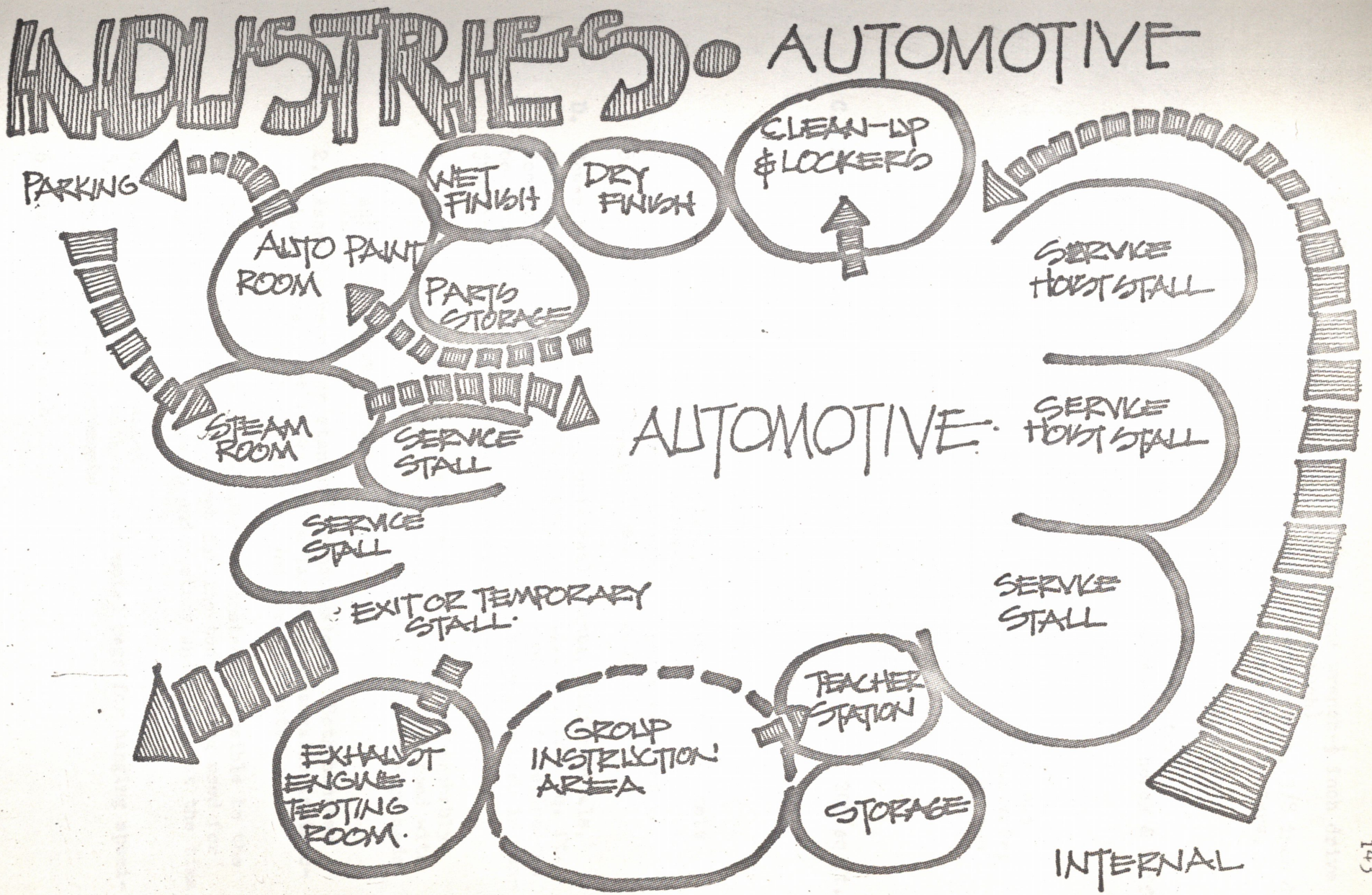
A. Tune-up stall . . . . . 200 sq. ft.

1. Exhaust analyzer
2. Timing light
3. Dwell meter
4. D.C. volt-ohmeter to test wiring resistance
5. Deep well socket set for spark plugs, etc., 3/8 inch drive
6. Set of ignition and carburation gauges
7. Solvent tub and basket
8. Wiring cabinet
9. Small hand tools to be provided by students
10. Service record desk with manuals and parts catalogs

B. Engine testing and overhaul room . . . . . .300 sq.ft.

Whenever possible, the equipment identified should be applicable to diesel engines as well as gasoline units.

1. Dynomometer
2. Engine analyser (sun machine or equivalent) including exhaust analyser
3. Oil pressure testing gauge
4. Compression and vacuum gauge


INDUSTRIES. AUTOMOTIVE
PARKING
AUTO PAINT ROOM
WET FINISH
DRY FINISH
CLEAN-UP & LOCKERS
PARTS STORAGE
SERVICE HOIST STALL
STEAM ROOM
SERVICE STALL
AUTOMOTIVE
SERVICE HOIST STALL
SERVICE STALL
SERVICE STALL
EXIT OR TEMPORARY STALL
EXHAUST ENGINE TESTING ROOM.
GROUP INSTRUCTION AREA
TEACHER STATION
STORAGE
INTERNAL

5. Socket set complete including torque wrench-$\frac{1}{2}$ inch drive (may be accompanied by a pneumatic wrench)
6. Socket set, complete, including torque wrench, 3/8 inch drive
7. Special wrenches for various auto makes for starters, water pumps, etc.
8. Micrometer thickness gauge and surface gauge set
9. Valve tool set
10. Ring tools, groove reamers, compressors, etc.
11. Electric drill, 3/8 inch with ridge reamers, hones & buffers
12. Valve grinding machine
13. Gear pullers
14. Bench grinder and buffer
15. Solvent tank and basket
16. Service record desk with manuals and parts catalogs
17. Small hand tools, such as mallets, pliers, adjustable; open end and combination wrenches, screw drivers, and hammers to be supplied by students
18. Engine exhaust discharge stack
19. Engine mounting bolck
20. Portable adjustabel boom arm engine hoist

C. Brake Service, Air and Hydraulic . . . . . 200 sq.ft.

1. Brake spring tool
2. Drum turning lathe
3. Electric drill with cylinder hone
4. Bearing packing machine
5. Pneumatic wrench, $\frac{1}{2}$ inch drive, with lug and nut sockets
6. Bleeding hose, pump, and reservoir
7. Service record desk, with manuals and parts catalogs
8. Air brake pump service tool set with gauges

D. Power train, transmissions, universal joints, differentials, and rear axles and axle bearings. .....200 sq. ft.
Some of the testing of these various units of the driveline can be accomplished on the dynomometer. Others must be used in conjunction with a power operated testing bench.

1. Testing bench with an operational power source, probably a 220V, variable speed, constant rated motor equipped with the gauges required for numerous American and foreign made automatic transmissions.

2. Assembly bench for standard transmissions. Both benches should have chart racks with enlarged diagrammatic instructions to aid both the student and the instructor.

3. Tool bench. This item should be constantly visible to the instructor, be locked except for the tools being used for the specific transmission under study and repair at the time.

4. Solvent tank and basket
5. Portable pegboard with various metal pegs for hanging specific assembly arrangements

6. Buffing wheel bench

E. Chassis and front end . . . . . 200 sq. ft.

1. Front end alignment table installed at floor level with service pit
2. Socket set, complete with torque wrench, $\frac{1}{2}$ inch drive
3. Bars, pry, spring and rail
4. Dynamic wheel balancer combination for testing tire roundness
5. Pneumatic wrench
6. Pneumatic chisel
7. Hand punch and chisel set
8. Medium and heavy hammers
9. Solvent tub
10. Service record desk with manuals and parts catalogs

F. Body and Frame . . . . . 400 sq. ft.

1. Portable acetylene torch, hose, regulators, valves and tanks
2. Chest of hammers, dollies, spoons, spreaders, and bars
3. Pneumatic chisel and bits
4. Socket set, $\frac{1}{2}$ inch drive
5. Stock cabinet for plastics, lead and solder
6. Electric disc sander
7. Pneumatic belt sander for wet work
8. Mauls and sledges
9. Hydraulic jacks for frame work
10. Small hand tools, such as screwdrivers, pliers, and straight wrenches to be provided by students
11. Portable scrap bin

G. Instruments and gauges . . . . . 100 sq. ft.

1. Variable milliamp-volt-ohmeter, AC*DC
2. Armature lathe
3. Armature growler and testing light
4. Hydraulic pressure gauge
5. Circuit continuity tester for remote control systems
6. Pressure and vacuum gauges appropriate for both gasoline and diesel engines.

H. Stock room . . . . . 400 sq. ft.

Some of the pneumatic and electric drill items may be considered as check-out items from the stock rooms. However, the problems of time distribution and excessive wear may make it economically inadvisable. Such items as a pneumatic floor jack, five sets of adjustable frame standards, the acetylene torch unit and the portable A" frame and chain hoist should be considered as stock room items.

The storage of motor oil, solvent or gunk, charts, paint, bolts, nuts, and standard items should identify the remaining functions of the storage rooms. Parts for specific jobs should be ordered only as the determination of their need becomes evident.

I. The steam room . . . . . .225.sq. ft.

The steam room is a stall approximately 15' x 15' within the perimeter of the general shop. A vehicle being brought into the area as a study and repair project should have its engine

and undercarriage steam cleaned to provide maximum instructional visibility for the students, as well as for reasons of maintaining a clean shop.

1. An external steam unit, if gas fired, or an internal high rate of recovery 220V steam boiler system with operating pressure capacity of 250 PSI and popoff valve at 300PSI
2. High pressure hose with jet head and insulated control piece
3. High volume exhaust fan
4. Overhead door system at both ends of the zone to prevent undue moisture into the adjacent shop areas

J. Entrances to both the wet and dry filtered finish rooms to provide adequate facilities for such functions as painting engine blocks, transmissions, auto doors, etc., as items separable from a complete paint job.

K. The infrared paint and finishing room should be approximately 12' x 15' . . . . . 180 sq. ft. It should be equipped with wall and ceiling mounted infrared panels sealed against dust, moisture, and paint vapors. Compressed air and a mechanical paint mixing station are required accessories in this well exhausted enclosed area. No open flames or spark-causing devices should be present in this area.

L. Group instructional area and instructor station .....625 sq. ft.
M. Storage . . . . . 200 sq. ft.
N. Locker space . . . . . 320 sq. ft.
O. Vehicle circulation . . . . . 1000 sq. ft.

V. Visual Environment

A. Lighting

1. The provision of natural light is not desirable in that it increases light control problems and may, because of the fixed position of work projects, hinder visability by unfavorable light, shadows, and glare.

2. Artificial lighting at an intensity of 50 ft. candles measured at 30 inches from the floor should be adequate. Overhead fluorescent units set flush with the ceiling and the light source should be sealed against dust and moisture.

VI. Special Requirements

A. Floors

1. A large sump with a steel grid should be provided in the steam room to permit the accumulation of grease and dirt steamed from engines and auto undercarriages.
2. A series of two or three centralized floor drains to serve the service stalls should be provided to maintain cleanliness in the general shop area. These should drain to a sump pit along the outer wall.
3. A special service pit is required for the front end service and alignment stall. It should be protected by appropriate railings and a gate.
4. The finishing rooms should be provided with small sumps for the accumulation of paint residue from the floors.

5. A minimum of two hydraulic vehicle hoists should be provided to permit adequate instruction, observation, and practice.

B. Lockers

The provision for the storage of shop clothing could be accounted for either in the stall area or near the clean-up station.

C. Waste Disposal

Considerable accumulation of waste material, such as oil cans, putty, lead, solder, solvent, and parts containers is unavoidable in connection with automotive work. A system of trash and waste containers and an appropriate external storage device should be provided for.

Perhaps a large external gas fired incinerator will be the answer to the trades and industries section so far as the disposal of combustibles is concerned.

GREAT FALLS VOCATIONAL-TECHNICAL CENTER
Industries
Air Conditioning and Fluid Power

I. Introduction

The relationship of air conditioning to fluid power is rapidly becoming closer. The ventilation of electronic equipment for specific temperatures has recently been discovered as a critical factor in the durability and accuracy of performances for many such devices. Recently, the use of low pressure, thermally operated pneumatic valve systems in new computer, electronic, and operating control equipment has made the technical applications of hydraulics, pneumatics, and air conditioning almost inseparable.

Much of the laboratory testing and learning equipment now available combines both categories into single panel units. The current popular applications, however, require that basic instruction be differentiated, particularly at occupational entry levels of skill.

The spatial arrangements recommended herein should meet the beginning requirements of these two courses of instruction for laboratory and project space as well as the specific instruments and testing procedures.

Because of the increasing scope of these two fields of technology, the construction of this instructional unit should be such that maximum flexibility of space and equipment accompany the increase of instructional space.

II. Space Relationships

A. External

The laboratory and testing equipment spaces for the air conditioning and fluid power courses should be situated to open onto the corridor which provides access to the classrooms and resource center complex on the same floor, and should be adjacent to the metallurgy and foundry areas.

Access should be provided to the outside from the shop section of the laboratory via a 12' x 14' overhead door to permit the receipt and delivery of equipment, materials, and projects. An external personnel door should be provided in conjunction with the overhead door. Both points of access should be securely lockable.

Double doors should be provided as access to the hallway in a manner that will permit two-directional flow of personnel traffic without interference.

B. Internal

Three distinct space divisions should be provided. An area enclosed by non-bearing temporary walls should house the testing equipment for heating, air conditioning, and refrigeration. That space is identified in this report as the thermodynamics laboratory.

A second space of similar construction should be provided for the hydraulics testing equipment, and is identified in this

report as the fluid power laboratory.

A larger space should be provided for combined shop facilities that will accommodate work benches and project equipment such as automobiles, light service excavating trenching and loading machines, automobile air conditioning, domestic and commercial refrigerators, and protable pressure unite such as sprayers or boilers.

The following are the minimum space requirements:

1. Thermodynamics laboratory . . . . . 360 sq. ft.
2. Fluid power laboratory . . . . . 300 sq. ft.
3. Shop laboratory . . . . . 1320 sq. ft. including storage space for pipe, tubing, hoses, fittings, and sheet metal.

III. Furniture and Equipment

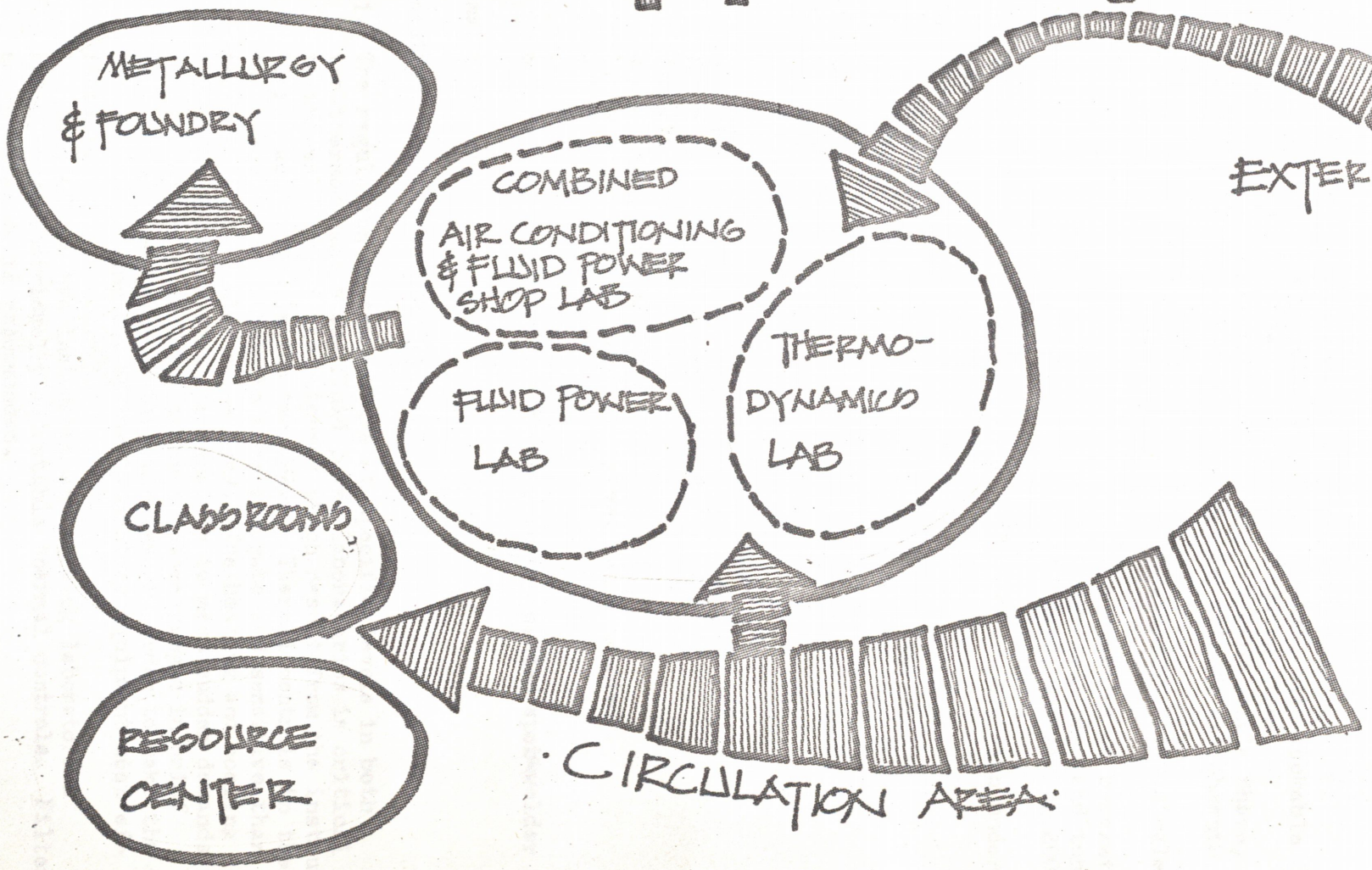
A. Thermodynamics laboratory

1. Ten portable benches with locking casters for stationary positioning, wired with a 15-foot, heavy duty 110V extension cord and cluster outlets, and lockable underneath storage, 60" x 30" x 30" high, support the following analysis, testing, and demonstration equipment.
2. Air conditioning, refrigeration, and reversible heat pump system panel, similar to Scott Engineering Model 9086.
3. Double pipe heat exchanger (6 pass) system panel, similar to Scott Engineering Model 9052.
4. Radiation temperature measurement system panel, similar to Scott Model 9053.
5. Free and forced conviction system panel, similar to Scott Model 9054.
6. Film and drop condensation system panel, similar to Scott Model 9055.
7. Analog fluid circuit system unit, similar to Scott Model 9012.
8. Phase heat exchanger, with gas fluid boiler, similar to Scott Model 9058.
9. Flame reaction kinetic system unit, similar to Scott Model 9050.
10. Automotive air-conditioning system unit, similar to Scott Model 9078.
11. Pneumatic fluid power education system, similar to Scott Model 9088.

B. Fluid power laboratory

1. Fluid circuit unit, including valves, gates, and controls, similar to Scott Engineering Model 9009.
2. Fluidics system panel, similar to Scott Model 9082.
3. Fluid power system panel, similar to Scott Model 9087.
4. Mobile, fixed displacement, hydraulic power supply unit, 110/220V single phase, similar to Southeastern Engineering Model EM 200-20-1.
5. Hydraulics components kit, 14 components, similar to South-Eastern E 200-30B-14.
6. Fluidic pneumatic 29-item component kit and panel, similar to Southeastern Model 300-127.

AIR COND. & FLUID POWER



7. Three portable tables, with losking casters for stationary positioning, lockable storage, and a 15-foot, heavy duty 110V extension cord with cluster outlets, for housing items 3, 5, and 6 above.

C. Shop/laboratory

1. Machine stall, 10' x 14', with floor drain and sump.
2. Pipe and tubing bench, 30" x 60" x 28" high, with lockable tool storage drawers, to house the following items:
   a. Pipe and tubing cutter-threader, 110/220V single phase, with reaming, flaring, seating, and cut-off attachments, $\frac{1}{2}$" to 1" capacity.
   b. Tubing cutter-threader with all attachments, 110V single phase, 1/16" to $\frac{1}{2}$" capacity.
3. Wall storage rack, 12' x 4' x 8" deep, consisting of bracket arms at 4" vertical intervals for storing small pipe and tubing.
4. Fitting storage cabinet, 56" x 33" x 6" deep, containing 200 $2\frac{1}{2}$" x 3" x $5\frac{1}{2}$" drawers.
5. Three hardwood top work benches, 28" x 48" x 30", with underneath storage drawers.
6. Sheet metal equipment
   a. Pan brake, 4'
   b. Press brake, 6'
   c. Bar folder, 3'
   d. Squaring shears, 3'
   e. Lockformer
   f. Throatless shear
   g. Slip roll, 4' x 3"
   h. Slip roll, 3' x 2"
   i. Rotary bench machine, 6' x 6'
   j. Stake bench, 4' x 8'
   k. Soldering bench, 3' x 10'
   l. Notching and punching machines, bench mounted
   m. Vise bench, 60" x 30" x 32"
   n. Grinder and buffer, 8"
   o. Pedestal mounted, 18" throat, foot-operated spot-welder

IV. Thermal Environment

A. Heating, cooling and ventilating

1. The regulation of temperature at specific levels in both the thermodynamics and fluid power laboratories is critical to the validity of the outcomes which result from the instructional activities in the two areas. Thermal controls in the two laboratories should be more accurate and sensitive than those used in regular classrooms. The heating and cooling system should have adequate capacity to meet sudden demands for either small or large thermal change ranges in brief periods of time, such as five minutes, in order to make the instructional time use of the laboratory equipment most efficient.

   Each of the two instrument and testing laboratories should have individually adjustable thermal controls. Filtered ventilation is recommended.

2. The shop section of the air conditioning and fluid power laboratory requires normal key-operated, adjustable thermal controls with ventilation at a rate of .65 cfm.

B. Acoustics

1. The thermodynamics and fluid power laboratories should be acoustically treated at ceiling and floor levels.
2. The laboratory shop should have acoustically treated ceilings.

V. Visual Environment

A. Illumination

1. Natural lighting should be eliminated from both the thermodynamics and the fluid power laboratories to permit maximum control of the thermal environment by removing solar heating.
2. Natural lighting in the shop section of the laboratory may be desirable if it does not cause undue glare and shadows or uncontrollable solar heating.
3. Artificial illumination should be provided in the two instrument laboratories by well-diffused overhead fluorescent fixtures set flush with the ceiling supplying an intensity of 50-foot candles, measured at 30" from the floor.
4. Shop lighting should be provided by diffused overhead fluorescent units that produce a minimum of 40-foot candles, measured at 30" from the floor.

GREAT FALLS VOCATIONAL-TECHNICAL CENTER
Electronics

I. Introduction

A. General Philosophy

The field of electronics technology has become so broad with so many areas of specialization that the basic economics of space and time for both the students and the center is to be primarily concerned with entry level skills and comprehensive theory knowledge and understandings.

The skills required are those of the use of hand and shop tools, the care and use of testing instruments, and the analysis of trouble symptoms to correction of the cause. The habits of thoroughness in work and safety practices are equally important.

Specialization in such areas as appliance, radio, television repair, ignition electronics, video equipment electronics technology, computer, and instrumentation should remain with the graduated student and his employer.

II. Spatial Relationships

A. The complex should be large enough to house four general areas: . . . . . total 3600 sq. ft.

1. An area for electrical power distribution . . . 700 sq. ft.
   a. Lineman
   b. Electrical appliance maintenance
2. Audio-visual reproduction, equipment, and maintenance . . (radio, phonograph, television, intercom) . . . 700 sq. ft.
3. Classroom . . . . . 900 sq. ft.
4. Instructors' offices . . . . . 300 sq. ft. (connected with storage facilities)

   With the exception of the instructors' offices, each class area should be large enough to accommodate a maximum of 25 students. The instructors' offices should accommodate three instructors. The storage area can serve all three class areas.
5. Rest room . . . . . 100 sq. ft.

B. Relationship of complex to other complexes

A separate wing should be reserved adjoining the instructional materials center. Easy access to the complex is desirable since equipment consists of heavy materials, television, computers, electrical appliances, etc.

C. Storage space for the complex and each class area . . . 200 sq. ft.

Each classroom should have basket storabe cabinets along the walls for students' tools, books, etc. These storage areas can serve as room dividers. In addition to basket storage, cabinets are also needed for tool storage. A key panel should

be wall mounted. Shelves should be above each work area to hold service manuals and related equipment.

A central storage room should be adjacent to the instructors' offices. This room should be large enough to hold large goods and all the supplies needed for all instructional phases of the electronics complex.

D. A listing of storage facilities is as follows.

1. Power distribution, electrical appliance, and electronics rooms
   a. Sixty storage baskets and wall receptacles for baskets
   b. Tool storage cabinets, six units, lockable, 4' x 4' x 10"
   c. Key panel, wall mounted
   d. Book and manual storage shelves

2. Instructors' offices
   a. Storage for books and literature in built-in shelves
   b. Two desks for personal storage
   c. Built-in wardrobe cabinet
   d. Built-in magazine and book storage shelves of three shelves, 8' long

3. Stock room . . . . . .900 sq. ft.

The stock room should have sufficient storage space to supply the entire complex. This means small component storage and bulk storage. An area of 900 sq. ft. should be adequate. Storage will be primarily in shelving space, 30% of which should be adjustable. The shelves have to accommodate oscilloscopes, generators, hydraulic pipe benders, small component storage, etc. Shelf specifications are:

   a. One hundred, 1' x 1' x 1'
   b. Fifty, 2' x 2' x 2'
   c. Twenty-five, 4' x 2' x 3'
   d. Ten, 8' x 4' x 4'

Consideration must be given to the location of shelves. Shelves should not be higher than 5' nor should large shelves meant for heavy equipment be at the top of the shelving area.

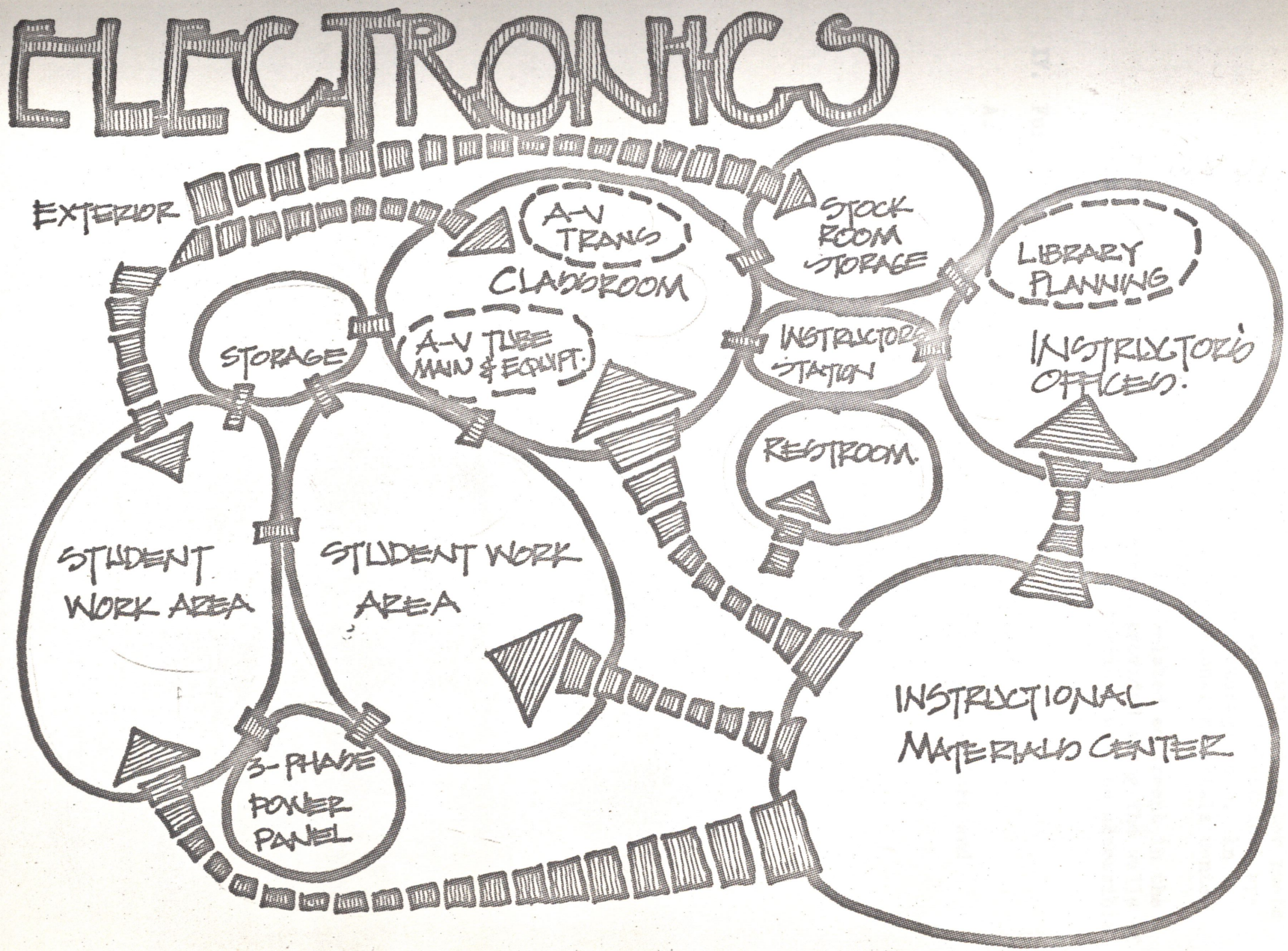
In addition, storage of in dividual testing equipment will be at each instructional area in lockable cabinets as already specified.

III. Traffic

A. Access

Each training area shall have entry and exit from the instructional materials center. In addition, the storage area, power distribution area, and electrical appliance area shall have access to delivery areas so that goods can be brought into and services rendered directly to the respective classrooms.

B. Power distribution room
   a. The power distribution room will have work desks from which students will move to and from test benches, instructor's desk, storage areas, etc.
   b. Entrances and exits will be from the instructional materials center and electrical appliance room.


ELECTRONICS
EXTERIOR
A-V TRANS
CLASSROOM
A-V TUBE MAIN & EQUIPT.
STORAGE
STOCK ROOM STORAGE
INSTRUCTOR'S STATION
RESTROOM
LIBRARY PLANNING
INSTRUCTOR'S OFFICES
STUDENT WORK AREA
STUDENT WORK AREA
3-PHASE POWER PANEL
INSTRUCTIONAL MATERIALS CENTER

C. Materials traffic

Heavy items such as transformers and generators will be brought into the instructional areas from the rear entrance of each room except the electricity classroom.

The storage room will have double doors without center posts leading to the delivery area. The classroom and electrical appliance room will also have access to the storage room. In addition, the entrances from the instructional materials center can serve as materials traffic flow.

Students will store test items and related equipment in the rooms themselves with storage shelving provided along the walls of each room. The library and research materials will be accessible from the instructors' offices.

IV. Furniture and Equipment

A. Instructors' equipment

This area is to provide space for three instructors and furniture:

1. Three desks and chairs
2. Three file cabinets
3. Three sections of modular shelving
4. Clothing and storage cabinet
5. Thr ee additional chairs

GREAT FALLS VOCATIONAL-TECHNICAL COMPLEX
Drafting Complex

I. Spatial Relationships

The total floor space of the drafting complex should be 2400 sq. ft. minimum. Within the complex are the following spatial subdivisions:

1. Desk zone. . . . . (including aisle space) 1152 Sq. ft.
2. Clothing storage . . . . . 20 sq.ft.
3. Carrels . . . . . 60 sq. ft.
4. Drafting library . . . . . 36 sq. ft.
5. Clean-up stations . . . . . 48 sq. ft.
6. Wall storage . . . . . 400 sq. ft.
7. Floor storage . . . . . 250 sq. ft.
8. Instruction station . . . . . 160 sq. ft.
9. Instructor's office . . . . . 120 sq. ft.
10. Photographic laboratory . . . . . 120 sq.ft.
11. Reproduction and computer graphics laboratory . . . . 230 sq. ft.

Exterior spatial relationships:

The drafting complex should be adjacent to the graphic arts complex due to common equipment in the reproduction process. The most desirable situation for both complexes would be on the north side of an east-west corridor or concourse. Drafting should be located within a reasonable distance of the electronics center and the computer laboratories.

II. Traffic

A. Access
   1. Two entrances are required to the desk zone
      a. One from the corridor
      b. One from the outside that provides access to a parking area
   2. Interior access points are required as follows;
      a. Clothing storage access near the corridor entryway
      b. Access to the carrels from the aisle at the rear of the class
      c. Access to the display wall to the left of the corridor entrance
      d. Access to the drafting library bordering the rear aisle of the classroom and adjoining the carrel section
      e. Access to the clean-up station in the corner of the complex beyond the library station and next to the outside entrance
      f. Access to 35 linear feet of wall storage bordering the aisle along the exterior wall of the complex
      g. Access from two sides, front and back, to the floor storage unit adjoining the instruction station podium
      h. The reproduction and computer graphics room should have access to both the drafting and graphic arts complexes. The doorways should be situated so that if future division of the room space is required, access to both internal spaces is possible.
      i. An entrance must be provided to the photography laboratory so that extraneous light is not admitted when a student enters.

This facility must provide access from the graphic arts complex.

j. The instructor's office should be provided with entrances to both the corridor and the classroom.

B. Internal traffic

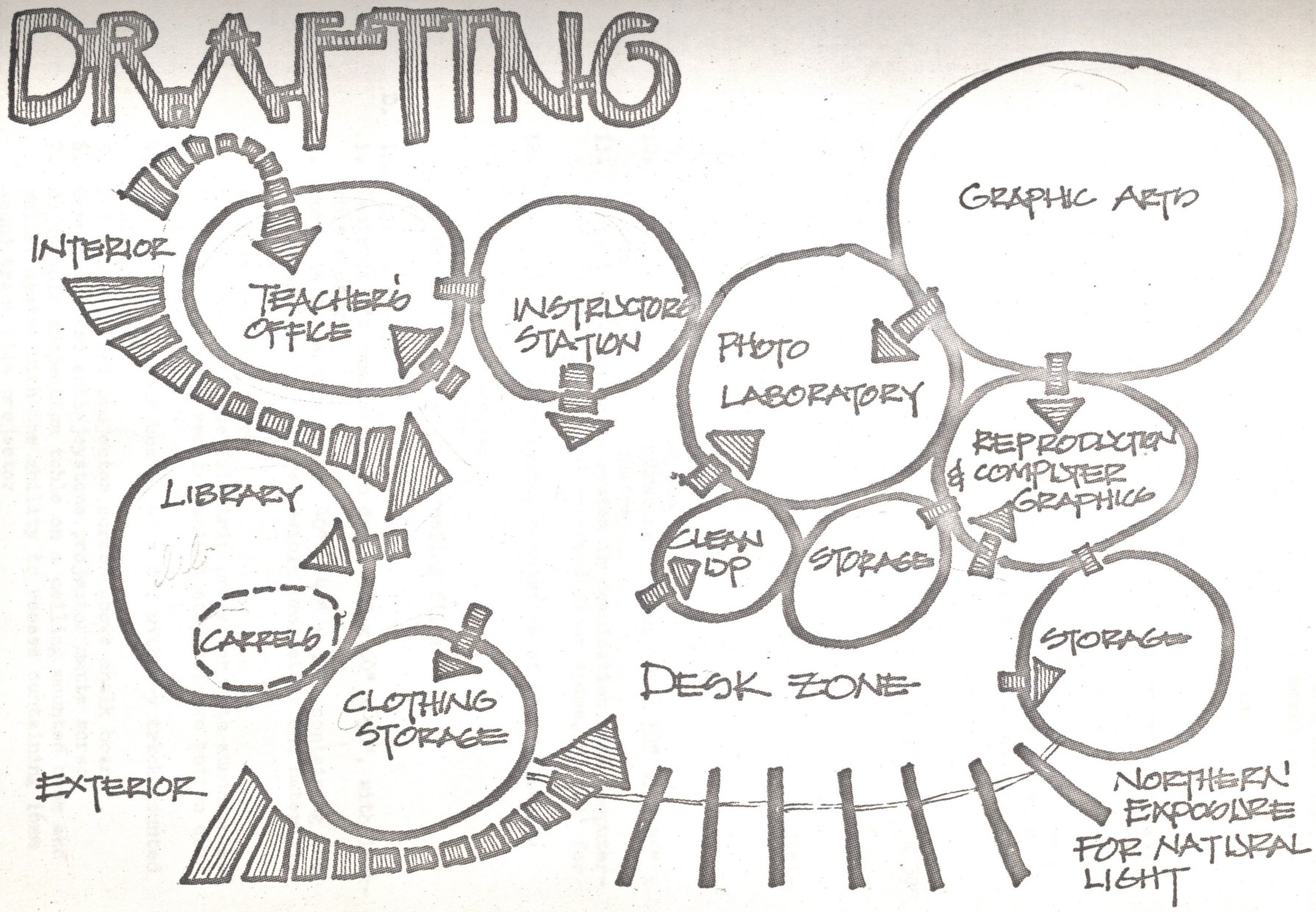
1. Points at which congestion may occur at various times throughout the day should be given special spaces attention. The following stations indicate the space treatment required.
   a. Clothing storage: The provision of a 4' aisle plus recessing the clothing storage unit 18" behind the carrel stations provided a $5\frac{1}{2}$' x 10' space in front of that storage unit.
   b. Clean-up station: The arrangement of 3 sinks along 8' of wall space with an operating width of 6' should provide ample space for cleaning equipment and wash up during and after class sessions.
   c. The provision of 4' aisle spaces along the 59 linear feet of wall and floor storage, all of which is 36" deep, should provide ample operating and traffic space.
   d. The instructor's office requires more space than the average office by reason of the need to design drafting problems that correspond to the skills being taught and for student counseling.
   e. The photography laboratory must provide sufficient space for two revolving cylinder doors, one each from drafting and graphic arts, and adequate space for student and instructing personnel from both departments.
   f. The reproduction and computer graphics area provides for the introduction of current diazo and reproduction processes and other new and innovative equipment. Activity in this space may require subdivision at a later date so ample dimensions are needed.

C. Materials traffic

The provision of aisle space and the access from both the outside parking area and the interior service corridor should provide ample space for the movement of large paper stock items and assembled machinery for assembly and disassembly purposes.

III. Furniture and Equipment

A. Instructor's office
   1. Hamilton combination drafting and office desk
   2. Desk chair
   3. Two conference chairs
   4. Lighted tracing table for student work grading
   5. Adjustable posture back drafting stool
   6. Legal size four-drawer file cabinet
   7. Typewriter
   8. Telephone connected to the outside through central switchboard
   9. Book shelves, wall stack, 10" shelves, 6' x 6'


DRAFTING
INTERIOR
TEACHER'S OFFICE
INSTRUCTOR STATION
GRAPHIC ARTS
PHOTO LABORATORY
REPRODUCTION & COMPUTER GRAPHICS
LIBRARY
CLEAN UP
STORAGE
CARRELS
STORAGE
DESK ZONE
CLOTHING STORAGE
EXTERIOR
NORTHERN EXPOSURE FOR NATURAL LIGHT

B. Photographic laboratory
   1. Built-in counter top, 30" x 12' x 30", with a seamless, stain proof, non-porous synthetic top and underneath storage of covered drawers and adjustable shelving
   2. Counter top, double-tub, stainless steel sink with double drain boards
      a. Each tub, 60" x 18" x 8"
      b. Each drain board, 12" x 18"
      c. Mixing, swing-type faucet with standard photo laboratory temperature controls
   3. Wall cabinet, 3' x 13" x 6', above sink near wall
   4. Two wall cabinets on end walls, 3' x 13" x 3'
   5. Counter top cabinet, 28" x 4' x 30", synthetic resin top with underneath covered drawers and adjustable shelving
   6. Photographic printing and enlarging equipment as required to furnish the graphic arts needs

C. Reproduction and computer graphics room
   1. Counter top cabinet with synthetic resin top, 30" x 7' x 30", and underneath storage
   2. Spirits duplicator
   3. Direct process ink duplicator
   4. Photo process duplicator
   5. Wall cabinet above work table, 12" x 42" x 12' with adjustable shelving and sliding doors
   6. Blue print machine console, 40" x 60"
   7. Microfilm reader and table, 30" x 36" x 30"
   8. Microfishe reader and table, 30" x 36" x 30"
   9. Two adjustable drafting stools
   10. Two adjustable lighted tracing tables, 40" x 52" with 36" x 48" frosted glass tracing plates
   11. Circuit jack for telex system in combination with computerized calcomp plotter and reserved floor space, 3' x 4' for the console unit
   12. Microfilm duplicator system consisting of the following:
      a. Microfilm camera
      b. Microfilm processor
      c. Microfilm printer
      d. Microfilm reader for proofing films

D. Instruction station
   1. Instructor's demonstration desk, 30", x 60" x 30", with lockable storage
   2. Portable projection table, 40" x 48" x 32", containing the following side by side recessible projectors and materials storage
      a. Overhead projector
      b. Combination slide-filmstrip projector with sunchronized audio tape and remote control stop-release button cord
   3. Instructor's chair
   4. Two panels of chalk board, 4' x 8', with x-y track mounted drafting square
   5. Pull-down beaded projector screen above chalk board
   6. Corner mounted anti-jeystone projector matte screen
   7. Adjustable projection table on a ceiling mounted boom and pulley system with the ability to recess containing 16mm sound track film projector

8. A storage cabinet, 14' x 3' x 5½', should be located near the raised instructor's station and contain the following elements in double-faced arrangement for student and instructor accessibility.
   a. Two tiers of 41 locking drawers per tier, each drawer 34" x 36" x 1½", for student project storage
   b. Two tiers of 24 locking drawers per tier, each drawer 34" x 46" x 6", for materials storage
9. A control panel for classroom lighting and for the control of the projector boom and projector should be provided near the instructor's demonstration desk to control light dimming and projector operation.

E. Student desk area
1. Ten drafting tables, 38" x 48", 90 degree vertical adjustable top with metal bound squared and parallel edges and six storage drawers, 2½" x 18" x 30"
2. Twenty drafting tables, 15 degree horizontal adjustable top with metal bound squared and parallel edges and six storage drawers, 2½" x 18" x 30"
3. Ten drafting machines, x-y track type, 36", without scales
4. Five drafting machines, vertical type, 24" arm without scales
5. Five drafting machines, standard radial, 24" arm, with automatic index head and without scales.
6. Drafting machine, left hand standard radial, 24" arm, with automatic index head and without scale
7. Nine parallel straight edges, 48"
8. Ten adjustable posture back drafting chairs for the vertical tables
9. Twenty adjustable drafting stools, 27" to 33"
10. Fifteen electric erasers in conjunction with fifteen low pressure air nozzles for cleaning paper work and drafting machines
11. The wall separating the class space from the corridor should be finished in textured tack board panels for display purposes.
12. Students must purchase their own drafting machine scales.

F. Wall storage, total units, 35 linear feet, 3' x 78"
1. Surveyor instrument storage, 3' x 3' x 5', with 12" overhead shelf space
2. Roll paper storage must be provided for tracing tissues, linens, and charts; pigeon holes varying from 3" x 3" x 36" to 10" x 10" x 36" should be provided above a model storage space of adjustable shelving, 4' x 4'
3. The remaining 28 feet of 3' x 78" wall cabinets should provide storage for the following items plus miscellaneous equipment in the form of shelves and drawers
   a. Paper cutter
   b. Tapes and rules
   c. Templates
   d. Films
   e. Three 8mm single concept self-contained screen and projector units available for use in the carrels

G. Clean-up station
1. Counter top cabinet 8' long with under-the-top storage and containing three stainless steel sinks, 10" x 12" x 8", with mixing taps. Wall mirrors should be provided at each sink.
2. Soap and paper towel dispensers
3. Waste receptacle bins built under the counter top

H. Library
1. Layout table, 36" x 5' x 30"
2. Six stacking type student chairs
3. Book shelves, 10" wide wall stacks, 8' x 6'

I. Carrels
1. Five carrels, 3' x 4' x 7', with a 28" wide bracket mounted work top wired for 110V outlets for lamps or audio-visual equipment
2. Five carrel chairs

J. Clothing storage

This unit is for the storage of students' outer clothing. It should be constructed of a horizontal bar, 10' long, 54" above the floor, to support clothing hangers. A 30" wide shelf should be constructed 66" above the floor the full length of the bar to provide storage for hats, books, etc.

IV. Visual Environment

A. Illumination
1. Natural light is most desirable if provided by a northern exposure; otherwise windows may be undesirable. If a northern exposure is possible, the windows should be placed above the built-in wall storage.
2. Artificial lighting should be provided in criss cross pattern diagonally related to the orientation of the drafting desks at an intensity of 45' candles at the general desk top level or 36" from the floor. Controls should be located near the instructional station for audio-visual equipment usage.
   a. Lighting intensity in the instructor's office should be 35' candles.
   b. The lighting in the photography laboratory should consist of two circuits:
      1) One circuit should provide current to a diffused 110V incandescent fixture for a low voltage bulb.
      2) The other circuit should provide for either a black light or an infrared lighting source. The control that operates the infrared interior light should also operate an exterior warning light on each door to show the laboratory is in use for light sensitive processes.
      3) The lighting requirements for the reproduction room are 30' candles, measured 30" from the floor.

V. Special Requirements

The connections which provide access of the drafting department to time sharing participation of computer facilities or to the local

computer system should be provided for by including the required internal circuiting with external terminal fixture. The benefits of such facilities can be briefly and generally summed in the following time saving and errorless operations.

A. Student work correction by plotter overlay on student work

B. Graphic communications processes that provide students with goal orientations demanded by the rapidly advancing industrial technology

C. Instructional equipment and materials for such technology

D. Applied correlation of computer and numerical control systems into direct production via automated welding, machining, and founding.

GREAT FALLS VOCATIONAL-TECHNICAL CENTER

Graphic and Photographic Arts

I. Introduction

Graphic artists and photgraphers are unique in the broad field of communications in that they are required to command skills of interpretive, creative, and expressive configurations that influence the conceptualizations made by the receiver of the printed and graphic information.

The degree of sophistication attained by the American public in the utilization and effectiveness of the graphic and photographic arts has been greatly accentuated by the almost universal application of the mass communication media, such as television, newspapers, periodicals, and merchandising brochures and pamphlets. The audio-visual methods of public school instruction and the film theaters has further increased that particular sophistication.

The computer-scanner processes, that have recently been intrpduced, have increased the time pressures that are traditionally connected with graphic and photographic technology and related occupations such as technical illustration and drafting.

Because of the high degree of sophistication and the advent of computer scanner procedures, job entry levels of skill are quite high and specialization is mandatory to meet the time demands that are constantly increasing.

Students who will qualify for job entry level skills in the graphic and photographic arts require intensive training in highly specialized skills in order to meet the production time and quality demands of those occupations.

II. Space Relationships

A. External

1. The graphic and photographic arts complex should be directly connected to the darkroom which is adjacent to the drafting complex.
2. It should also be very close to the computer section so that class work in the growing field of computer-scanner operations and information retrieval can be adequately instructed.
3. Access from the outside of the building should be provided to receive stock materials for the art, printing, modeling, and darkroom storage units.

B. Internal

The division of instructional spaces should provide maximum flexibility and maximum control of activity and materials for specialized individual and group activity. The following descriptions of space should be equipped to provide maximum instructional capacity for the development of the greatest possible skills in the students.

1. Basic drawing, design, and composition. . . . .1220 sq. ft.
2. Advertising layout laboratory. . . . . 1220 sq.ft.

3. Studio. . . . . 1400 sq. ft.
4. Press shop . . . . . 1000 sq. ft.
5. Molding and modeling . . . . . 850 sq. ft.
6. Storage rooms . . . . . 300 sq. ft.

C. Traffic

1. Personnel

The movement of students and teachers will relate directly to the curriculum schedule for the most part, although as students advance in specialities and skills, the need for movement between areas will increase in order to successfully accomplish a sequential completion of a given project assignment. The provision of doors for such individual movement between sections of the commercial arts complex should be so designed as to allow maximum freedom of movement with minimum disturbance to class sessions.

The provision of portable walls between the basic art, studio, and molding laboratories should be provided for large group demonstrations and instruction in comprehensive course materials.

2. Materials traffic

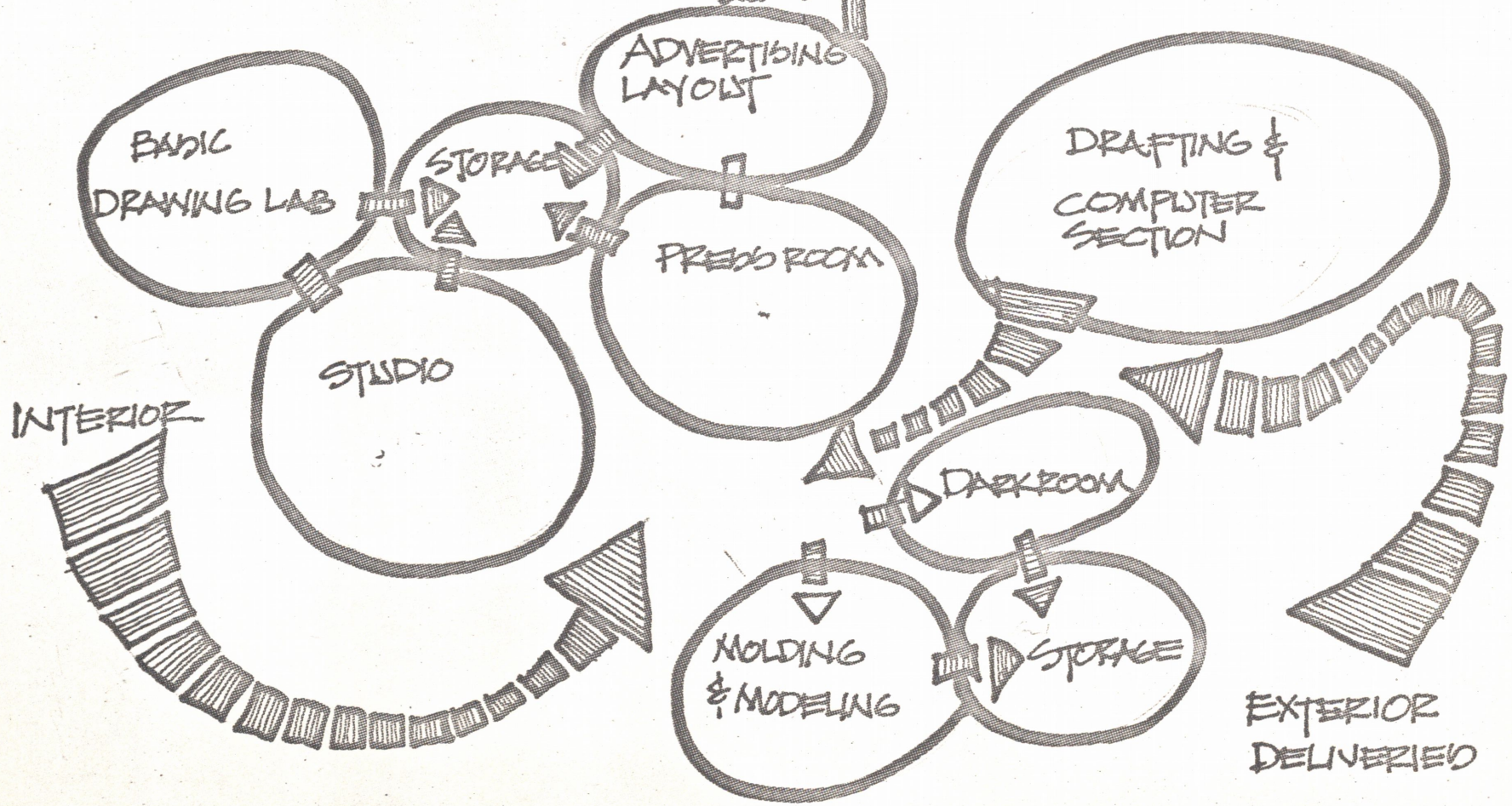
The receipt of stock materials to the storage rooms should parallel commercial situations as closely as possible without creating undue control measures in the educational process. The location of storeroom should be such that the student's participation in the course work would tend to keep him constantly aware of the need of economy of both time and materials in a highly competitive profession.

III. Furniture and Equipment

A. Basic drawing

1. Ten 2-station drawing tables with separated tilt top squared metal bound edges, with a locking 6-drawer dividing taboret, and two storage cells for 6 boards each, of tubular steel construction, similar to Garrett #AC462, 24" x 64" x 30"
2. Twenty adjustable, posture back drawing stools
3. Projector table, wired for 110V power projector outlets, containing the following units:
   a. Combination slide-film strip projector with tape or disc record sound facilities
   b. Overhead projector
4. Roll down, anti-keystone mounted projector screen
5. Three rolling double stand chart file units for sample reference filing, 25" x 42" x 34", similar to PlanHold #30RS1-18
6. Fold away, portable instructor's demonstration table, 39" x 50" x 41", similar to PlanHold caddy racks, 47CRI-36
7. Three materials supply cabinets, 26" x 48" x72", metal with adjustable shelving and locking doors
8. Model display table, 4' x 4', varying from 28" to 46", with hardwood top for mounting backdrops for model display
9. Portable, adjustable flood and spotlight stands for lighting models
10. Clean-up station

GRAPHIC & PHOTOGRAPHIC ARTS.....



B. Advertising layout laboratory
1. Eight sloped and squared topped proofing tables, 36" x 72" x 44", with two flexible mount fluorescent work lights per table and 12-drawer central taboret, 24" x 34"
2. Two proof sample tables, 28" x 72" x 34"
3. Two layout tables, 38" x 78" x 42"
4. Six adjustable, posture back, tubular steel stools
5. Fold away, portable instructor's demonstration table
6. Three chart file cabinets, 18-drawer, 26" x 36" x 55"
7. Tracing table with 32" x 38" frosted glass tracing surface and diffused fluorescent sub-lighting unit, sloped top, 36" x 48" x 44"
8. Clean-up station

C. Press section
1. Selectomatic, electric tape typewriter unit to serve in conjunction with the computer section
2. Offset press, 10" x 15" drum
3. Offset press, 14" x 21" drum
4. Direct contact transfer duplicator, 8½" x 13" drum or belt
5. Electronic scanner-perforator stencil machine
6. Horizontal camera, track mounted, vernier adjusted, bellows type, with 16" x 22" negative plate capacity
7. Plate burning table, 220V, 3 phase, 24" x 30" x 34"
8. Plate developing table and tank, 30" x 36" x 34"
9. Plate drier unit, 28" x 30" x 34"
10. Letter press, 220V, 3 phase power operated
11. Type bins and compositing table, 30" x 72" x 34"
12. Two work tables, 36" x 60" x 38", with non-porous tops and underneath storage drawers. One table should be equipped with wrapping and bundling equipment similar to the following:
    a. Two tier wrapping paper rack, with tear blades
    b. Binding tape dispenser
    c. Twine reel dispenser
13. Collator, 24-sheet capacity
14. Power stapler, 110V, 1½" capacity
15. Glue table, 26" x 30" x 30", mounted on casters, with 110V heat unit and 15' heavy duty extension cord
16. Clean-up station

D. Studio

Providing for the most flexible and adaptive use of this space requires the acquisition of the following portable equipment:
1. Portable collapsible stage, 2 sections each 4' x 6' x 28" extended
2. Portable collapsible risers, 8' rise, 3 ft. tread, 4 tiers, 3 sections, each section 6' x 12' extended
3. Rigid base, caster mounted, adjustable height, spot and flood lights
4. One each of two fold, three fold, and four fold screen frames
5. Caster mounted video tape camera, 2", 184 line
6. Video recorder cabinet with copier panel
7. Portable monitor and necessary cables for video tape equipment

The architectural design of the studio facility should be such that future expansion of space could be quickly and economically accomplished.

Various categories of portable work equipment, such as stacking type chairs, small tables, easles, and taborets should be available from the related storage room.

The silk screen sub-section of the studio should be located near the clean-up station, have its own storage cabinets, and be provided with three non-porous topped tables, 36" x 60" x 30".

E. Molding and modeling
1. Pug mill
2. Double tub laundry sink
3. Three seamless, non-porous, synthetic topped tables, with underneath storage
4. Electric kiln, 220V 3 phase fired, 3' x 3' x 3' capacity
5. Two potters wheels and benches, 18"
6. Curing cabinet, steel or epoxy finished laminated marine plywood for curing castings. It should have humidor strips around the edges of the doors.
7. Four storage cabinets, steel, 24" x 48" x 72" high

IV. Visual Environment

A. Illumination

Natural lighting is, at best, difficult to control and must frequently be blocked out to permit the use of audio-visual instruction. If natural lighting is necessary, the most desirable exposure of windows is to the north. The only other acceptable glass exposure is to the east, in order to minimize glare, uncontrollable solar heating, and undesirable shadowing on the work projects of the students.

1. The basic drawing and design laboratory requires a well diffused source of white light from criss-crossed over - head fluorescent units at a minimum intensity of 60 ft. candles, operated from control switches that will permit varied degrees of dimming for varied lighting needs.
2. The advertising layout laboratory requires a minimum of 40 ft. candles of diffused overhead fluorescent light. The use of adjustable work table lamps will permit the correct supply of working light, according to the needs of the task and the student.
3. The press room requires a minimum of 50 ft. candles of light, measured at 30" from the floor. The illumination should be well diffused from an overhead fluorescent source.
4. The studio area will house a wide variety of activities requiring maximum flexibility of lighting. It should receive a minimum intensity of 70 ft. candles on switch controls that will accommodate sectional dimming to total blackout to augment a wide range of flood and spot lighting combinations.
5. The molding and modeling laboratory requires a minimum of 50 ft. candles of light from well-diffused, overhead fluorescent fixtures.
6. The storerooms requires adequate lighting for the numerous textures, weights, and finishes of stock items.
7. The darkroom storage department should be equipped with special lighting facilities to permit adequate visual conditions without risking deterioration of photo sensitive materials.

B. Dividing structures

1. Walls should be non bearing in all locations where they are architecturally feasible.
2. Movable walls should be finished in a combination surface of sound reducing textured tack board surface and a specially treated writing surface that will receive crayon, china markers, graphite lead, wick and ball point pencil markings. The use of such surfaces for color demonstration and experimentation for studio work is unparalleled. These items should be similar to Modernfold and Moderncote surfaces.
3. Glass divisions in this complex should be avoided. The need for large areas should be met by portable walls that will permit adequate light control.

V. Special Considerations

The utilities connections and services in the advertising layout laboratory, the press room, and the modeling laboratory should be safety color coded.

SUMMARY OF REQUIREMENTS

SUMMARY OF SPACE REQUIREMENTS

ADMINISTRATION . . . . . 1200 sq. ft.

- Directors office . . . . . .150 sq. ft.
- Principals office . . . . . 100 sq. ft.
- Secretarys office . . . . . 100 sq. ft.
- Conference room . . . . . 600 sq. ft.
- Storage room . . . . . .100 sq. ft.
- Meeting room . . . . . .150 sq. ft.

OCCUPATIONAL RESEARCH and PLACEMENT CENTER . . . . . 200 sq. ft.

GUIDANCE . . . . . 2480 sq. ft.

- Counseling offices . . . . . .3 @ 120 = 360 sq. ft.
- Reception room . . . . . .300 sq. ft.
- Conference room . . . . . .1.@.120.&.2 @ 600 =1320 sq. ft.
- Audio visual . . . . . .400 sq. ft.
- Vault . . . . . 100 sq. ft.

TEACHER OFFICES

- Area required for each office . . . . . .120 sq. ft.
- Workroom (for each group of offices) . . . . . .150 sq. ft.

CLASSROOM COMPLEX . . . . . 4500 sq. ft.

- Classrooms . . . . . 6 @ approx. 750 sq. ft. ea.

LIBRARY-MULTI*MEDIA CENTER . . . . . .12,600 sq. ft.

- Reading room . . . . . 600 sq. ft.
- Librarian office . . . . . 120 sq. ft.
- Conference & audio-visual listening & viewing area . . . . . .1600 sq. ft.
- Periodicals . . . . . 600 sq. ft.
- Work room & audio-visual production . . . . . 400 sq. ft.
- Classroom and audio-visual room 2@ 600. . . . .1200 sq. ft.
- Circulation desk . . . . . .200 sq. ft.
- Card catalog area . . . . . 200 sq. ft.
- Teachers office & workroom . . . . . .400 sq. ft.
- Storage . . . . . 1200 sq. ft.
- Reading area & stacks . . . . . 6080 sq. ft.

BUSINESS EDUCATION . . . . . 4760 sq. ft.

Typing zone	450 sq. ft.
Advanced typing zone	750 sq. ft.
Business law, management admin., advanced business machines, bookkeeping	960 sq. ft.
Posting, billing, keypunch, computer programming	850 sq. ft.
Office machines	450 sq. ft.
Advance shorthand & office practice	750 sq. ft.
Beginning shorthand	550 sq. ft.

DISTRIBUTIVE EDUCATION . . . . . 4090 sq. ft.

Classroom	750 sq. ft.
Storage	600 sq. ft.
Merchandising zone	100 sq. ft.
Display area	50 sq. ft.
Students store	1080 sq. ft.
Instructors center & 8 instruc. areas @ 120 ea.	=960 sq. ft.
Secretarial center	250 sq. ft.
Instructors lounge	150 sq. ft.
Instructors work room	150 sq. ft.

DATA PROCESSING . . . . . 2285 sq. ft.

Computer operations center	1175 sq. ft.
Stock storage	200 sq. ft.
Office	80 sq. ft.
Key punch	170 sq. ft.
Records storage	160 sq. ft.
Seminar room	300 sq. ft.
Computer library	200 sq. ft.

HEALTH OCCUPATIONS . . . . . 1990 sq. ft.
PRACTICAL NURSING

Storage	200 sq. ft.
Locker & dressing	200 sq. ft.
Instructional area	800 sq. ft.
Instructor office (in group)	120 sq. ft.
First aid & sick bay	100 sq. ft.
Display case	20 sq. ft.
Study area	150 sq. ft.
Laboratory area	400 sq. ft.

DENTAL ASSISTANT . . . . . 2100 sq. ft.

Laboratory	650 sq. ft.
Darkroom	80 sq. ft.
X-ray room	100 sq. ft.
Operatories (4 chairs)	400 sq. ft.
Demonstration operatory (1 chair)	150 sq. ft.
Recovery room	150 sq. ft.
Classroom (with nursing)	
Storage	150 sq. ft.
Faculty office	200 sq. ft.
Waiting room	140 sq. ft.
Business office	80 sq. ft.

HOME ECONOMICS . . . . . 2400 sq. ft.

Demonstration kitchen	200 sq. ft.
Sewing area	1600 sq. ft.
Nursery school	450 sq. ft.
Laundry area	150 sq. ft.

CULINARY ARTS . . . . . 8915 sq. ft.

Cafeteria dining area	3300 sq. ft.
Teachers dining area	750 sq. ft.
Food serving lines	250 sq. ft.
Food preparation zone	1000 sq. ft.
Food storage	
frozen	200 sq. ft.
cold	220 sq. ft.
dry	250 sq. ft.
Fountain & shortorder	575 sq. ft.
Garbage service	120 sq. ft.
Classroom	750 sq. ft.
Dressing rooms & restrooms	800 sq. ft.
Food service office	200 sq. ft.
Furniture storage	500 sq. ft.

BUILDING CUSTODIAN

Use another classroom from another curriculum
Equipment storage throughout school as needed
. . . . . approx. 600 sq. ft.

TRADES & INDUSTRY

Building Trades . . . . . 3600 sq. ft.

Carpentry	450 sq. ft.
Cabinet making	600 sq. ft.
Masonry	450 sq. ft.

Plastering . . . . . 450 sq. ft.
Plumbing . . . . . 600 sq. ft.
Glazing . . . . . 600 sq. ft.
Wood technology . . . . . 450 sq. ft.

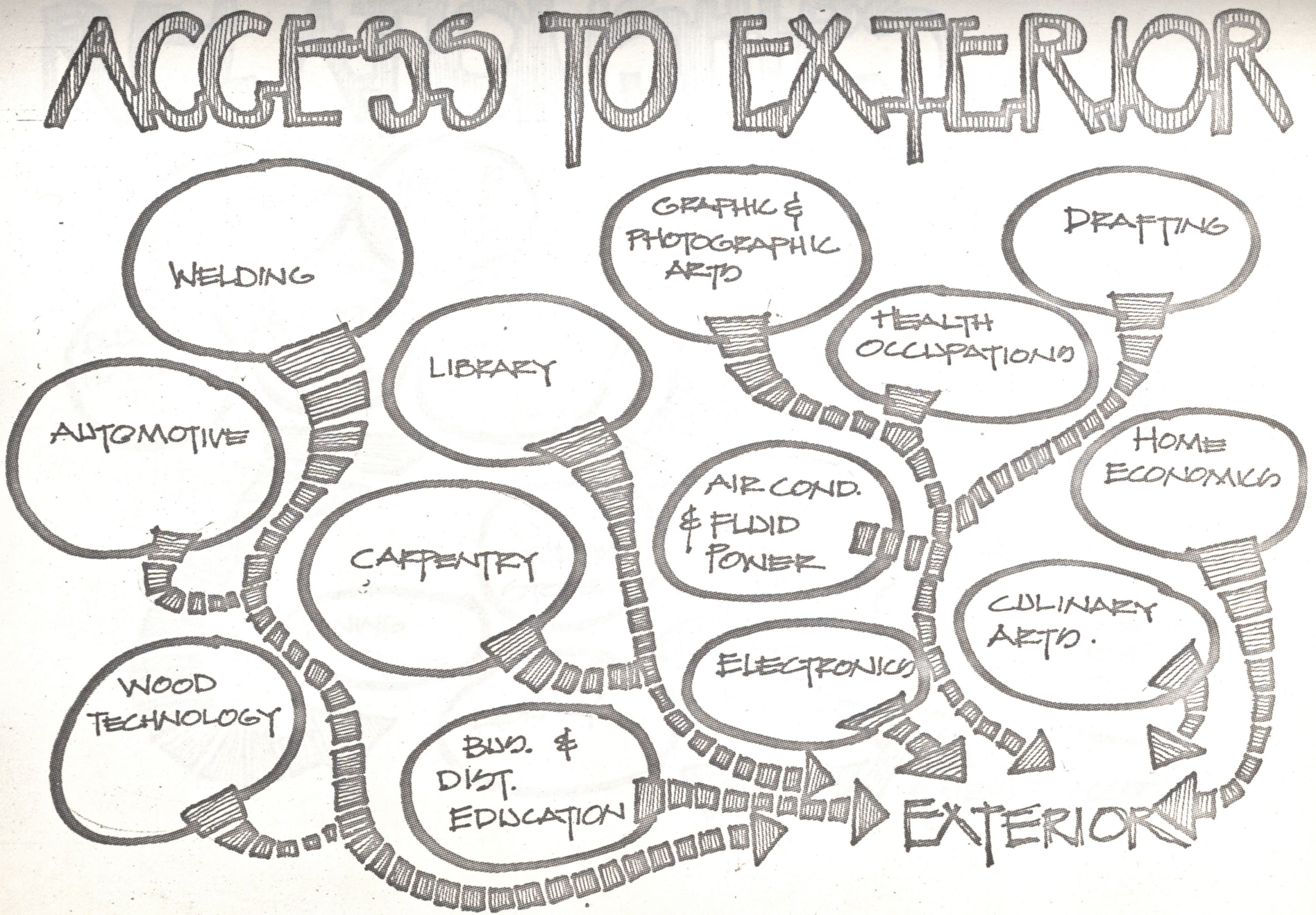
INDUSTRIES

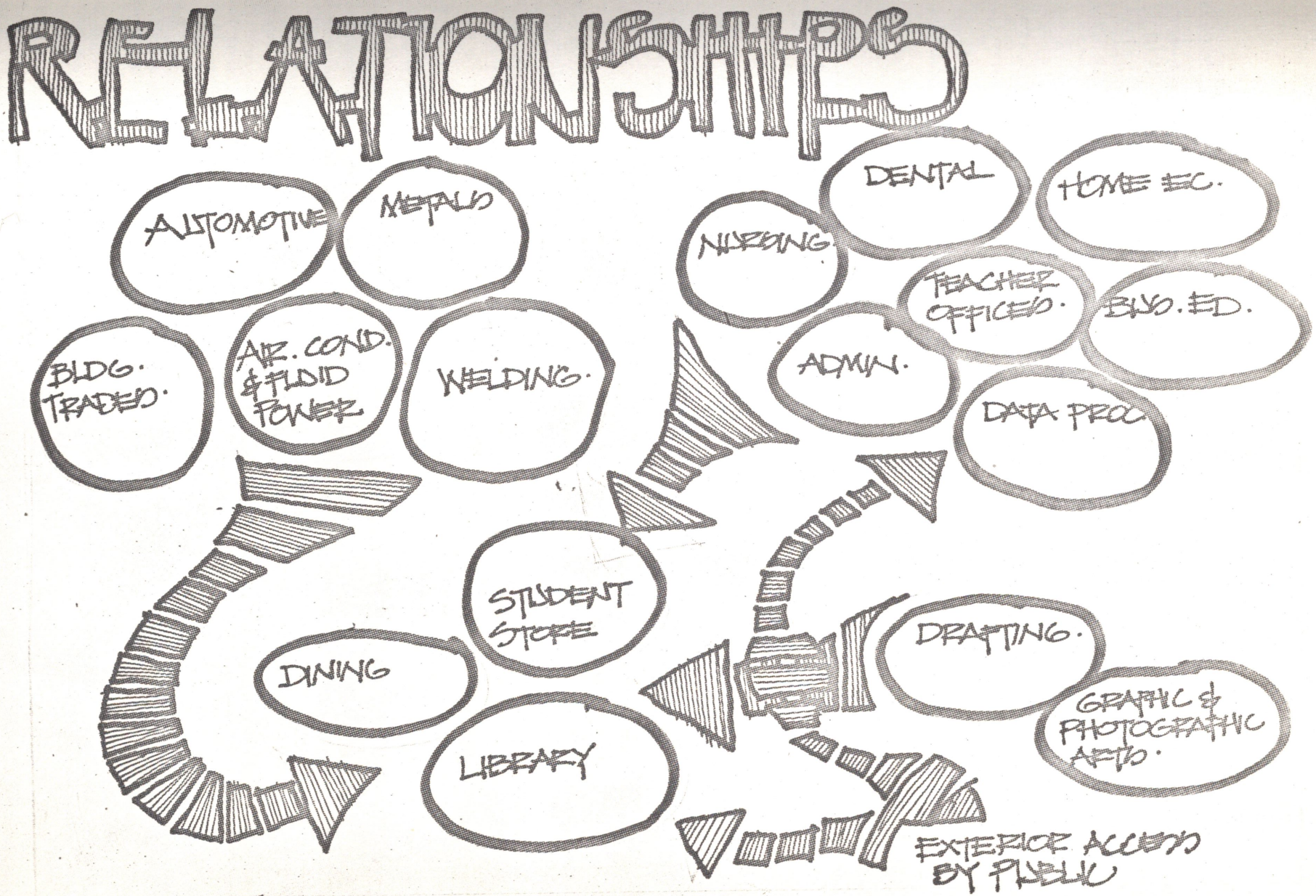
Metals . . . . . 3820 sq. ft.
Lathes & milling machines . . . . . 1485 sq. ft.
Metal saws . . . . . 325 sq. ft.
Grinding& finishing . . . . . 440 sq. ft.
Foundry & forging . . . . . .690 sq. ft.
Metallurgy . . . . . 880 sq. ft.
Welding . . . . . .3013 sq. ft.
Arc, mig, tig, & inert gas, shield welding booths . . . . . 275 sq. ft.
Acetylene welding booths . . . . . 140 sq. ft.
Structural steel practices . . . . . 135 sq. ft.
Aisle space between booths . . . . . 440 sq. ft.
Machine cutting zone . . . . . 435 sq. ft.
Metal stock storage . . . . . 720 sq. ft.
Grinding . . . . . 384 sq. ft.
Testing . . . . . 384 sq. ft.
Two gas storage cells (2@50 ea.). . 100 sq. ft.
Automotive . . . . . 4750 sq. ft.
Tune up stall . . . . . 200 sq. ft.
Engine testing & overhaul room . . . 300 sq. ft.
Brake service . . . . . 200 sq. ft.
Power train, transminssions, etc. . 300 sq. ft.
Chassis & front end . . . . . 300 sq. ft.
Body & frame . . . . . 400 sq. ft.
Instruments & gauges . . . . . 100 sq. ft.
Stock room . . . . . 400 sq. ft.
Steam room . . . . . 225 sq. ft.
Paint & finish room . . . . . 180 sq. ft.
Group instruction, vehicle circulation, & instructor station . . . . . 1625 sq. ft.
Storage . . . . . 200 sq. ft.
Locker space . . . . . 320 sq. ft.
Air Conditioning & Fluid Power . . . . . 1980 sq. ft.
Thermodynamic laboratory . . . . . 360 sq. ft.
Fluid power . . . . . 300 sq. ft.
Shop laboratory (includes storage) .1320 sq. ft.
Electronics . . . . . 3800 sq. ft.
Electrical power distribution . . . 700 sq. ft.
Audio-visual reproduction equip., & maintenance . . . . . 700 sq. ft.
Classroom . . . . . 900 sq. ft.
Instructor offices . . . . . 300 sq. ft.
Restroom . . . . . .100 sq. ft.
Storage . . . . . .200 sq. ft.
Stock room . . . . . 900 sq. ft.
Drafting . . . . . 2596 sq. ft.
Desk zone . . . . . 1152 sq. ft.
Clothing storage . . . . . 20 sq. ft.

Carrels	60 sq. ft.
Drafting library	36 sq. ft.
Clean-up stations	48 sq. ft.
Wall storage	400 sq. ft.
Floor storage	250 sq. ft.
Instructional station	160 sq. ft.
Instructors office	120 sq. ft.
Photographic laboratory	120 sq. ft.
Reproduction & computer graphics laboratory	230 sq. ft.

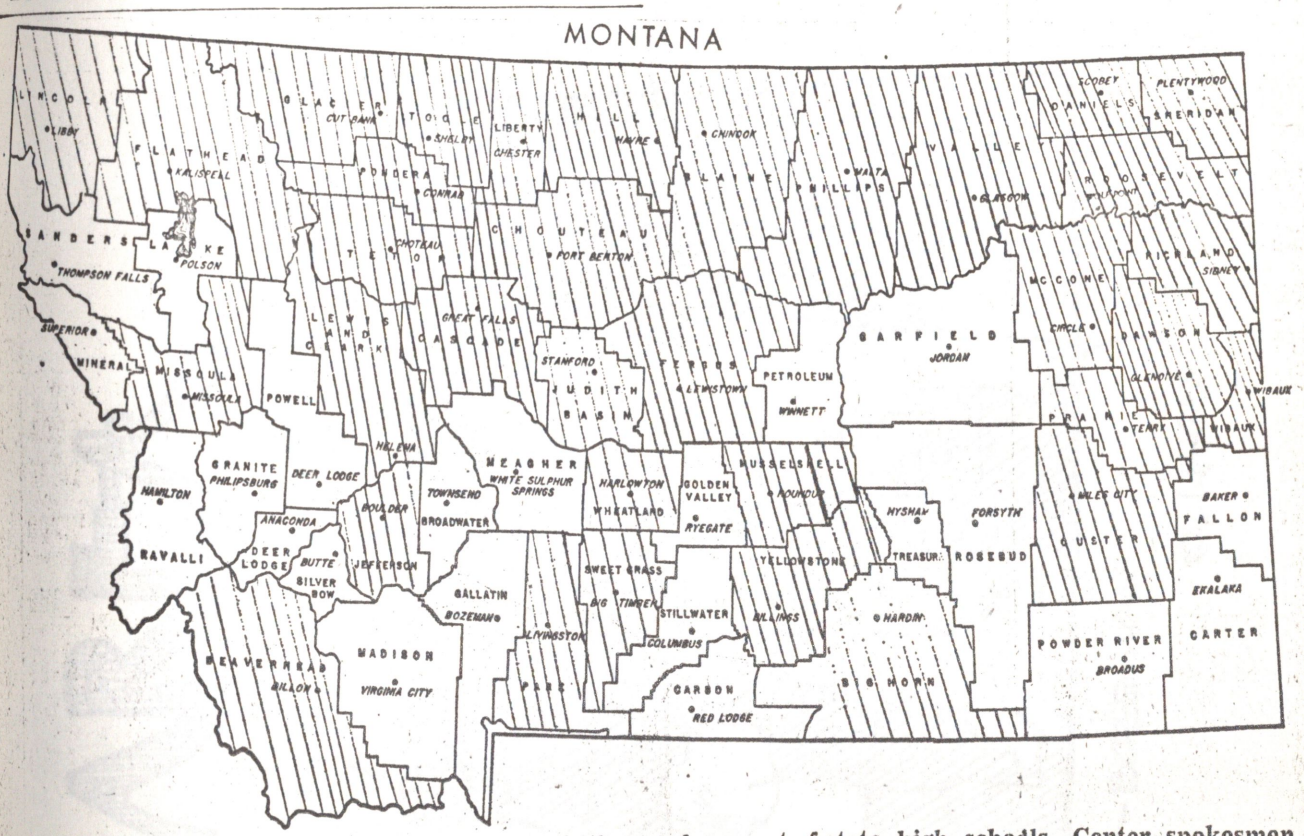
GRAPHIC & PHOTOGRAPHIC ARTS	5970 sq. ft.
Basic drawing, design, & composition	1220 sq. ft.
Advertising layout laboratory	1200 sq. ft.
Studio	1400 sq. ft.
Press shop	1000 sq. ft.
Molding & modeling	850 sq. ft.
Storage rooms	300 sq. ft.

TOTAL	77,049 sq. ft.


ACCESS TO EXTERIOR
WELDING
AUTOMOTIVE
LIBRARY
CARPENTRY
WOOD TECHNOLOGY
BUS. & DIST. EDUCATION
GRAPHIC & PHOTOGRAPHIC ARTS
HEALTH OCCUPATIONS
AIR COND. & FLUID POWER
ELECTRONICS
DRAFTING
HOME ECONOMICS
CULINARY ARTS.
EXTERIOR


RELATIONSHIPS
AUTOMOTIVE
METALS
BLDG. TRADES
AIR. COND. & FLUID POWER
WELDING
DENTAL
HOME EC.
NURSING
TEACHER OFFICES
BUS. ED.
ADMIN.
DATA PROC
STUDENT STORE
DRAFTING
DINING
GRAPHIC & PHOTOGRAPHIC ARTS
LIBRARY
EXTERIOR ACCESS BY PUBLIC

THE SITE



VO-TECH DRAWING AREA — Students at the Great Falls Vo-Tech Center graduated from high schools in 34 of Montana's 56 counties, a recent survey determined. The students represented 59 high schools and several other students graduated from out-of-state high schools. Center spokesmen pointed out that counties not represented in the enrollment, for the most part, are very sparsely populated.

Record enrollment predicted for vo-tech

Enrollment at the Great Falls Vo-Tech Center appears certain to make a significant increase again this year, as it has in each year since operation started five years ago.

With one full quarter of classes remaining, enrollment since the start of summer quarter stood at 455 last week, eclipsing last term's total enrollment of 436 students. Loran Frazier, assistant center director, estimated that total enrollment this year will end up extremely close to 500.

Since some classes are held for shorter periods of time and have been completed, the actual number of students in attendance in all classes this week was 315. The lack of a central facility results in students attending classes at Great Falls High School, Largent School and the Special Education Cetner in addition to the temporary headquarters of the center in the former Washington School.

There are 19 students enrolled in data processing and taking instruction both at the center and at the high school. There are 178 full-time day students or night students with 20 hours or more of night classes per week in secretarial, dental assistant or electronics training at the center.

At Largent School, there are 28 in licensed practical nursing training, with 20 more scheduled to start before the end of this month. There also are 16 in nurse aide training, with the students alternating their time between classroom training at Largent and on-the job training in Deaconess Convalescent Hospital and the County Convalescent Hospital in order for there to be sufficient classroom space for both types of instruction.

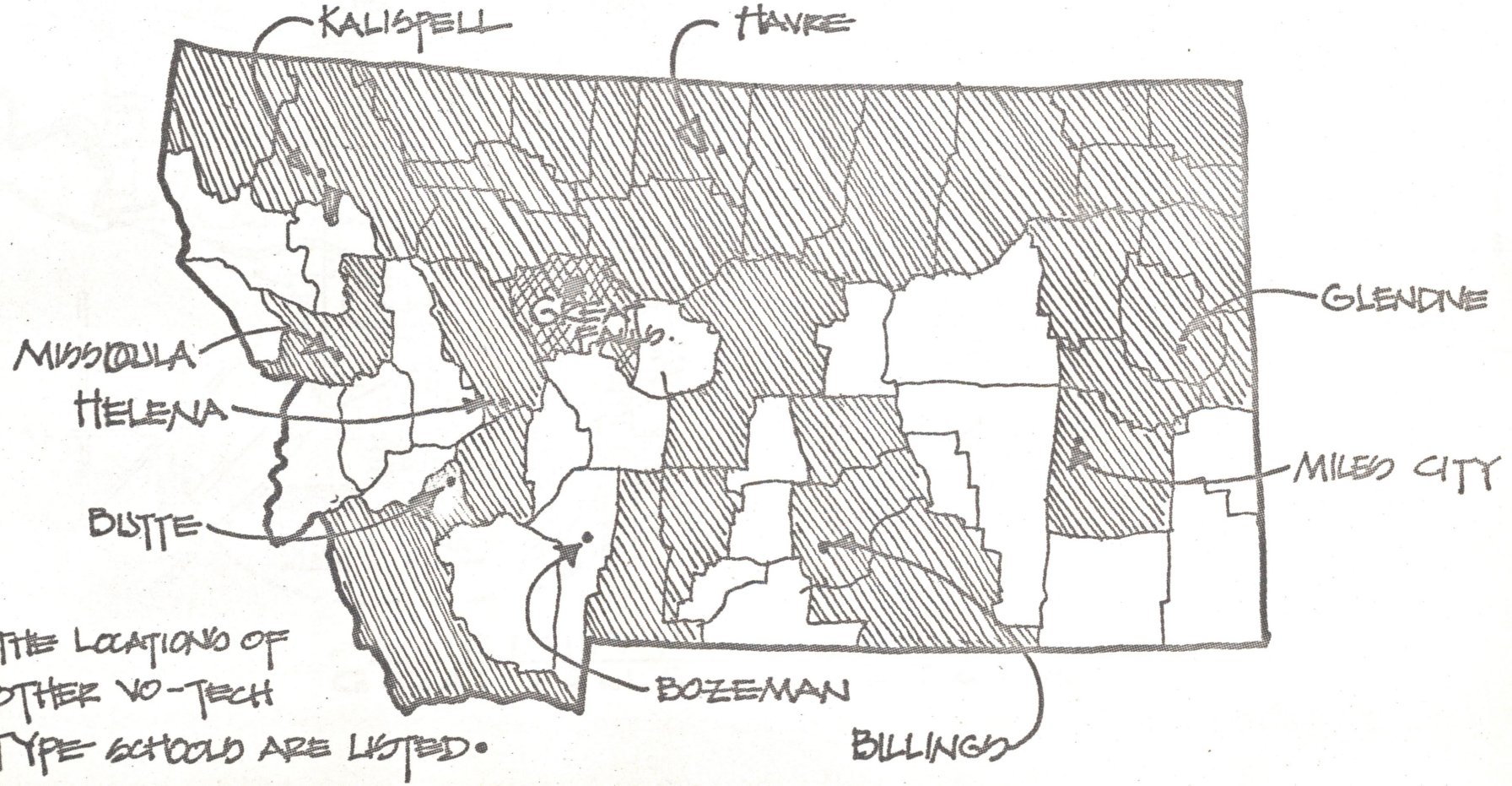
At the Special Education Center, the former DeMolay Memorial, there are 54 enrolled in a special needs project for persons with some type of serious learning disability.

Carl Spinti, also an assistant center director, said the local post-secondary vo-teach program started with a half-dozen part-time instructors in the 1968-69 term, and added that there are now 16 full-time instructors and 11 part-time, not counting any administrators or secretarial occupations within the center's operation.

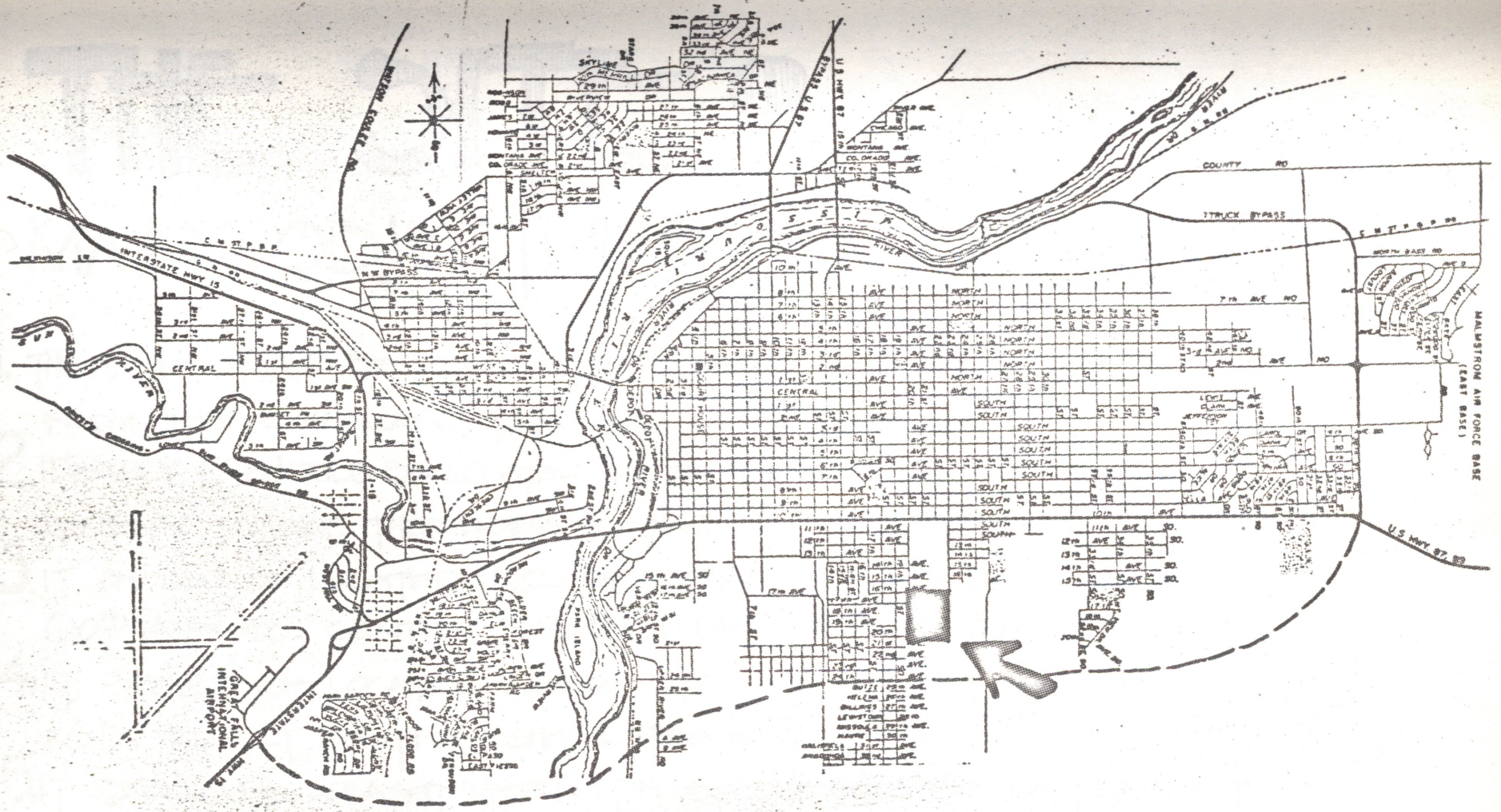
Great Falls Vo-Tech Center Enrollment:

	Students	Students and adult education
1968-69	57	
1969-70	275	1,865
1970-71	394	2,092
1971-72	436	1,871
1972-73	500 (est.)	2,000 (est.)
Totals	1,662	7,828

DRAWING AREA



• THE LOCATIONS OF OTHER VO-TECH TYPE SCHOOLS ARE LISTED •



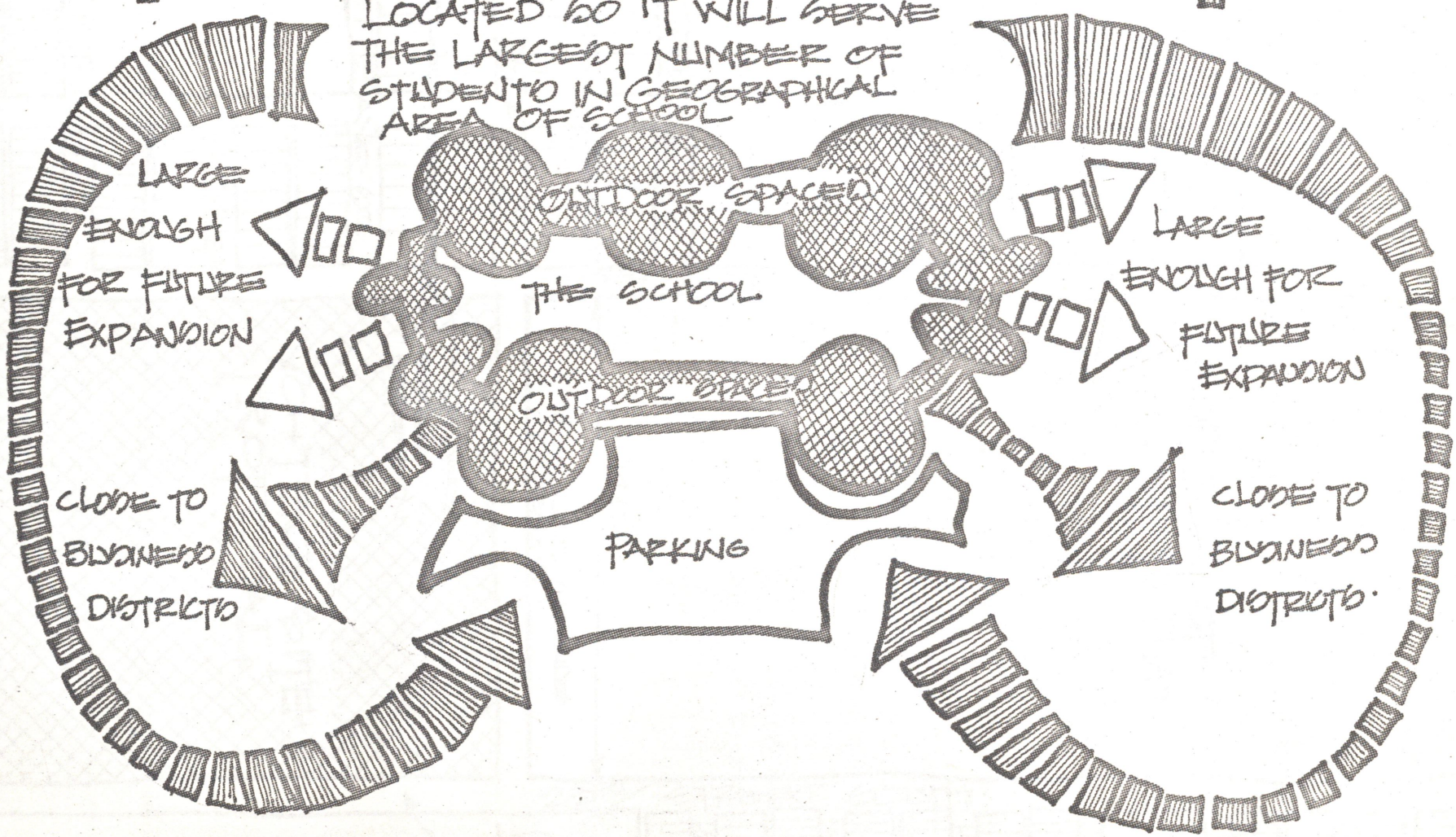
VICINITY MAP
GREAT FALLS, MONTANA

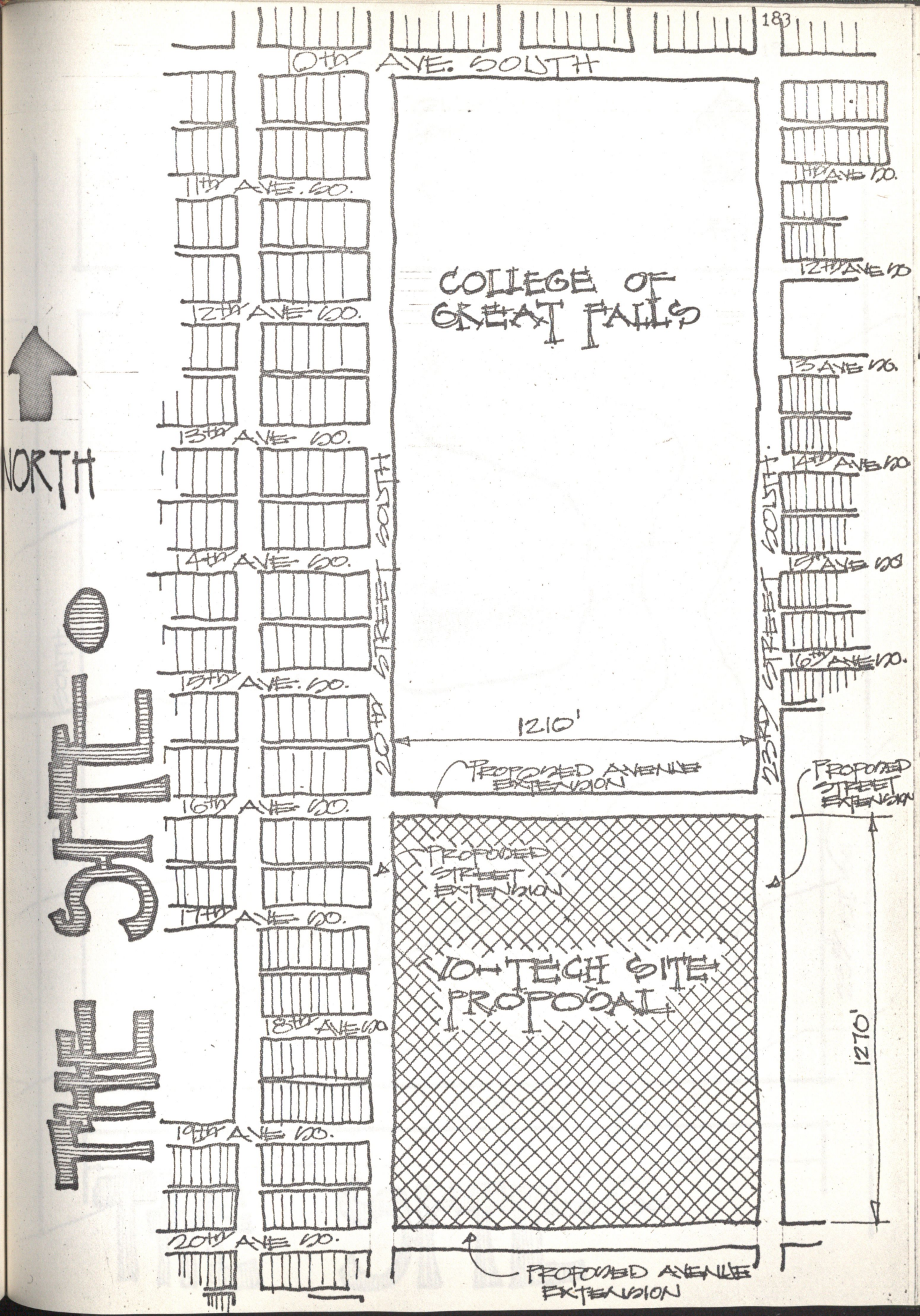
THE SITE.

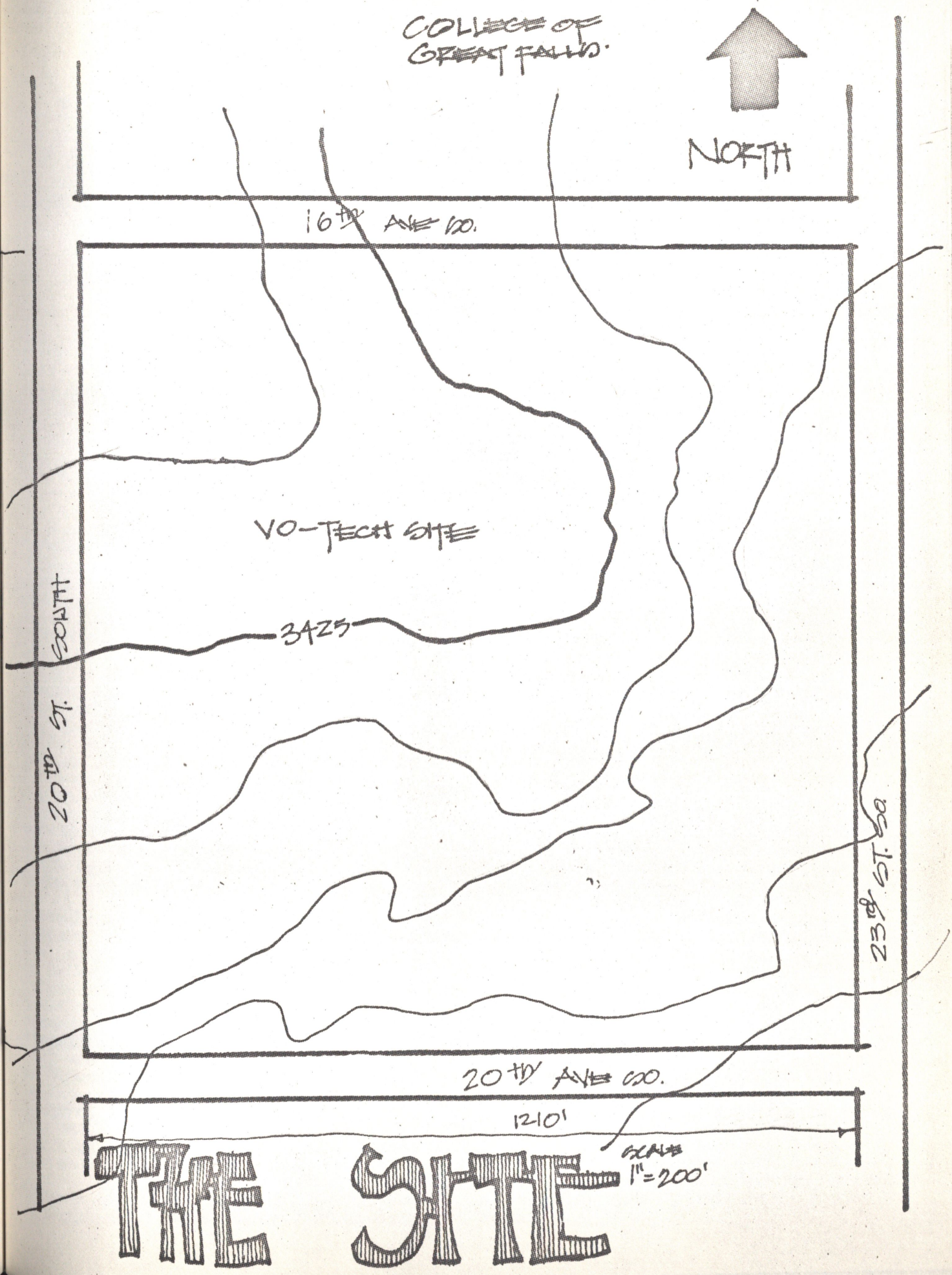
MAJOR OBJECTIVES FOR SELECTION.

1. THE SITE SHOULD BE LOCATED WHERE THE GENERAL AREA CAN BENEFIT FROM THE EXISTANCE OF THE SCHOOL AND ITS SITE.
2. IDEALLY IT SHOULD BE LOCATED WHERE IT CAN BE USED AS PART OF AN URBAN RENEWAL PROJECT, THEREFORE ACCOMPLISHING TWO OBJECTIVES.
3. IT SHOULD BE LOCATED IN CLOSE PROXIMITY TO THE BUSINESS DISTRICTS. (10TH AVE. SO., CENTRAL BUSINESS DISTRICT, AND THE WEST SIDE)
4. IT SHOULD BE LOCATED WHERE LITTLE OR NONE OF THE TAX BASE IS LOST AS A RESULT OF THE SCHOOLS PRESENCE ON THE SITE.
5. IT SHOULD BE LOCATED WHERE IT IS EASILY ACCESSIBLE FROM OFF-CAMPUS HOUSING WHETHER PRIVATE OR PUBLIC TRANSPORTATION IS USED.

SITE REQUIREMENTS




10th AVE. SOUTH
11th AVE. 120.
12th AVE. 120.
13th AVE. 120.
14th AVE. 120.
15th AVE. 120.
16th AVE. 120.
17th AVE. 120.
18th AVE. 120.
19th AVE. 120.
20th AVE. 120.
11th AVE 120.
12th AVE 120
13 AVE 120.
14th AVE 120
15th AVE 120
16th AVE 120.
COLLEGE OF GREAT FALLS
20th STREET SOUTH
23rd STREET SOUTH
1210'
PROPOSED AVENUE EXTENSION
PROPOSED STREET EXTENSION
PROPOSED STREET EXTENSION
NO TECH SITE PROPOSAL
1270'
PROPOSED AVENUE EXTENSION
NORTH
THE SITE


COLLEGE OF GREAT FALLS.
NORTH
16th AVE SO.
VO-TECH SITE
3425
15th SOUTH
20th St.
23rd St.
20th AVE SO.
1210'
SCALE 1"=200'

THE SITE

CLIMATE

UNITED STATES
DEPARTMENT OF
COMMERCE
PUBLICATION

LOCAL CLIMATOLOGICAL DATA

ANNUAL SUMMARY WITH COMPARATIVE DATA

GREAT FALLS, MONTANA

1971

U.S. DEPARTMENT OF COMMERCE NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION
ENVIRONMENTAL DATA SERVICE

NARRATIVE CLIMATOLOGICAL SUMMARY

The city of Great Falls is located astride the main stem of the Missouri River at its confluence with the Sun River, while the Weather Service Office is located at the Municipal Airport on a plateau between the Sun and Missouri Rivers. This plateau is about 200 feet higher than most of the immediate valley area, and the airport is about two miles southwest of the Sun and Missouri River Junction. Except to the north and northeast, the valley is encircled by mountain ranges, which lie about 30 miles away from east to south, 40 miles to the southwest, and 60 to 100 miles distant from west to northwest. Topography plays an important part in Great Falls' climate. The Continental Divide to the west, and Big and Little Belt Ranges to the south, are primary factors in producing the frequent wintertime "chinook" winds observed in this part of Montana. The valley - plateau combination in the immediate area contributes quite often to marked temperature differences between airport and City proper, either on calm, clear mornings, or when "chinook" winds appear at the airport before they are felt at the lower elevations in town.

Summertime in the area generally is quite pleasant, with cool nights, moderately warm and sunny days, and very little weather that can be called hot or humid. Most summer rainfall occurs in showers or thundershowers, but steady rains may occur during late spring or early summer. Most summers pass with the highest temperatures failing to reach 100°, and an average year will have only 15 days with maximums 90° or higher. Freezing temperatures do not occur in July or August, very rarely in June, and are observed only on two or three days in the usual May or September. Frost occurs frequently in April and October, but more often in the valleys than on the surrounding hills or plateau.

Winters are not so cold as is usually expected of a continental location at this latitude, largely as a result of the "chinook" winds for which this area is noted. While sub - zero weather is experienced normally several times during a winter, the coldest weather seldom lasts more than a few days at a time, and is usually terminated by southwest "chinook" winds which can produce sharp temperature rises of 40° or more in 24 hours. As a result of recurring "chinooks" throughout the winter season, snow seldom lies on the ground for more than a few days. In fact, the ground usually is bare, or nearly bare of snow, most of the winter, except in the surrounding mountains and higher foothills. On the other hand, invasions of cold air from the polar regions occur a few times each winter, and sharp temperature falls from above freezing to below zero within 24 hours are observed occasionally from mid - December to March.

Precipitation generally falls as snow during late fall, winter, and early spring, although rain can occur in any month. Late spring, summer, and early fall precipitation is almost always rain, but some hail is observed occasionally during summer thundershowers.

Although Great Falls' average annual precipitation would normally classify the area as semi-arid, it is important to note that about 70 percent of the annual total falls normally during the April - September growing season. The combination of ideal temperatures during the peak of the growing season, long hours of summer sunshine, and nearly 10 inches of precipitation during the six critical months, makes the climate very favorable for dryland farming. Heavy fog seldom occurs, incidence usually being limited to about one day per month, but each case lasts only a small part of the day. Although the average windspeed is relatively high, extremely strong winds (over 70 mph) seldom are observed, and visibility normally is excellent (15 miles or more).

Station: GREAT FALLS, MONTANA INTERNATIONAL AIRPORT Standard time used: MOUNTAIN Latitude: 47° 29' N Longitude: 111° 22' W Elevation (ground): 3662 feet Year: 1971

Month	Temperature: Averages: Daily maximum	Daily minimum	Monthly	Extremes: Highest	Date	Lowest	Date	Degree days (Base 65°): Heating	Cooling	Precipitation: Total	Greatest in 24 hrs.	Date	Snow, Ice pellets: Total	Greatest in 24 hrs.	Date	Relative humidity: Hour 05 (Local time)	Hour 11 (Local time)	Hour 17 (Local time)	Hour 23 (Local time)	Wind &: Resultant: Direction	Resultant: Speed	Average speed	Fastest mile: Speed	Fastest mile: Direction #	Fastest mile: Date	Percent of possible sunshine	Average sky cover sunrise to sunset	Number of days: Sunrise to sunset: Clear	Partly cloudy	Cloudy	Precipitation .01 inch or more	Snow, Ice pellets 1.0 inch or more	Thunderstorms	Heavy fog	Temperatures: Maximum: 90° and above ‡	32° and below	Minimum: 32° and below	0° and below	Average daily solar radiation - langleys
JAN	25.7	6.6	16.2	58	19	-30	14+	1509	0	1.22	0.41	6-7	16.2	4.9	9-10	61	56	56	60	24	9.5	14.2	42	SW	29	38	8.2	3	4	24	17	5	0	0	0	15	28	10	129
FEB	38.0	20.7	29.4	54	24	-5	5	993	0	0.65	0.18	2-3	8.9	2.5	2-3	64	57	56	65	24	10.7	14.4	46	SW	24	51	7.5	4	6	18	8	5	0	0	0	9	21	2	221
MAR	41.5	21.7	31.6	61	29	-4	1	1031	0	1.12	0.38	12-13	9.7	2.7	13	63	48	43	61	24	11.4	15.3	38	SW	12+	69	7.0	6	9	16	10	4	0	2	0	7	27	1	372
APR	57.3	32.6	45.0	76	14	19	1	594	0	0.66	0.56	17	4.7	4.1	17	61	42	35	52	23	4.6	12.6	38	SW	2	64	7.6	2	11	17	5	1	1	3	0	0	15	0	437
MAY	66.5	42.7	54.6	86	27	35	17+	320	6	3.03	0.90	5-6	T	T	17	65	47	41	58	24	2.4	11.0	38	SW	14	64	7.0	4	10	17	14	0	2	0	0	0	0	0	520
JUN	74.5	49.4	62.0	94	23	41	28+	134	30	0.62	0.44	6	0.0	0.0		65	39	35	58	24	6.9	10.8	33	SW	25	67	6.9	4	11	15	5	0	4	0	2	0	0	0	593
JUL	84.0	51.0	67.5	100	16	41	3	34	120	0.27	0.14	27-28	0.0	0.0		58	30	19	40	27	4.7	10.3	34	W	6	85	3.8	16	9	6	6	0	4	0	9	0	0	0	664
AUG	92.9	59.0	76.0	101	14+	45	24	5	351	1.16	0.70	29-30	0.0	0.0		50	28	20	38	24	4.0	10.4	35	S	22	80	4.1	16	9	6	6	0	8	2	24	0	0	0	541
SEP	66.8	42.5	54.7	88	6	30	22+	326	22	0.61	0.33	20	T	T	20 +	64	43	37	59	24	7.7	12.1	38	SW	11	66	5.9	9	7	14	7	0	1	0	0	0	3	0	381
OCT	55.7	33.6	44.7	84	9	0	28	628	8	0.30	0.15	15-16	3.8	1.8	27	69	50	45	60	24	9.0	14.0	45	SW	26	61	6.3	7	8	16	3	2	0	0	0	4	15	1	273
NOV	46.3	26.2	36.3	68	11	-13	6	854	0	0.36	0.29	4-5	4.2	3.6	4-5	63	53	53	63	23	12.4	14.6	43	SW	4	44	7.9	3	5	22	5	1	0	5	0	2	20	2	155
DEC	29.2	6.7	18.0	47	17	-17	16	1459	0	1.48	0.47	6-7	19.2	5.0	6	65	63	58	62	23	11.0	15.6	47	SW	31	36	6.9	7	7	17	11	7	0	3	0	14	30	12	119
YEAR	56.5	32.7	44.6	101	AUG. 14+	-30	JAN. 14+	7883	557	11.48	0.90	MAY 5-6	66.7	5.0	DEC. 6	62	46	42	56	24	7.8	12.9	47	SW	DEC. 31	63	6.6	81	96	188	97	25	20	15	35	51	159	28	367

NORMALS, MEANS, AND EXTREMES

Month	Temperature: Normal: Daily maximum	Daily minimum	Monthly	Extremes Ø: Record highest	Year	Record lowest	Year	Normal heating degree days (Base 65°)	Precipitation: Normal total	Maximum monthly	Year	Minimum monthly	Year	Maximum in 24 hrs.	Year	Snow, Ice pellets: Mean total	Maximum monthly	Year	Maximum in 24 hrs.	Year	Relative humidity: Hour 05 (Local time)	Hour 11 (Local time)	Hour 17 (Local time)	Hour 23 (Local time)	Wind &: Mean speed	Prevailing direction #	Fastest mile: Speed	Fastest mile: Direction #	Fastest mile: Year	Pct. of possible sunshine	Mean sky cover sunrise to sunset	Mean number of days: Sunrise to sunset: Clear	Partly cloudy	Cloudy	Precipitation .01 inch or more	Snow, Ice pellets 1.0 inch or more	Thunderstorms	Heavy fog	Temperatures: Max.: 90° and above ‡	32° and below	Min.: 32° and below	0° and below	Average daily solar radiation - langleys
(a)	(b)	(b)	(b)	11		11		(b)	(b)	34		34		34		34	34		34		10	10	10	10	30	15	28	28		29	30	34	34	34	34	34	34	32	10	10	10	10	19
J	31.6	12.5	22.1	61	1968+	-37	1969	1349	0.61	2.05	1969	T	1944	0.74	1966	9.7	22.6	1969	9.6	1943	67	63	62	67	15.7	SW	65	SW	1946+	51	7.2	5	7	19	9	3	*	1	0	16	27	12	133
F	34.0	13.6	23.8	64	1968+	-22	1962	1154	0.74	2.16	1958	0.01	1950	0.88	1951	9.0	26.1	1958	11.0	1951	67	59	55	66	14.9	SW	72	W	1954	59	7.3	4	7	17	8	3	*	1	0	8	24	3	222
M	41.1	20.2	30.7	72	1966	-19	1962	1063	0.92	2.18	1967	0.15	1960	1.01	1967	9.6	21.3	1967	10.0	1967	65	54	47	62	13.4	SW	73	W	1951	68	7.2	5	8	18	9	3	*	2	0	8	26	4	358
A	55.2	31.9	43.6	83	1969+	5	1964	642	0.98	3.69	1967	0.27	1938	2.43	1951	6.4	35.4	1967	9.2	1960	68	49	41	60	13.2	SW	70	W	1946	63	7.3	4	8	18	9	2	1	2	0	2	16	0	426
M	65.7	40.2	53.0	89	1964	19	1967	384	2.10	8.13	1953	0.67	1950	3.20	1953	1.4	8.1	1956	6.2	1967	68	46	40	59	11.4	SW	65	SW	1951	64	6.8	5	10	16	11	*	4	1	0	0	3	0	518
J	72.9	46.9	59.9	97	1961	32	1969	186	2.90	5.37	1965	0.52	1960	2.74	1964	0.5	11.1	1950	11.0	1950	71	46	42	62	11.3	SW	70	W	1958	65	6.5	6	10	14	13	*	7	1	2	0	*	0	565
J	84.7	54.1	69.4	100	1971+	41	1971	28	1.28	4.32	1955	0.04	1959	1.40	1950	T	T	1966+	T	1966+	65	37	28	49	10.3	SW	73	W	1951	81	3.9	15	11	5	7	0	8	*	9	0	0	0	630
A	81.8	51.8	66.8	106	1969+	37	1965	53	1.26	2.94	1950	0.03	1969	1.72	1950	0.0	0.0		0.0		58	34	25	44	10.6	SW	71	SW	1954	78	4.4	14	10	7	7	0	6	*	11	0	0	0	519
S	71.2	43.5	57.4	98	1967	23	1965	258	1.20	3.56	1941	0.10	1962	1.70	1945	1.3	7.7	1954	6.1	1954	64	45	37	56	11.7	SW	73	NW	1945	67	5.6	10	9	11	7	1	2	1	2	*	3	0	382
O	59.3	35.6	47.5	85	1964+	0	1971	543	0.73	1.89	1957	T	1965+	1.15	1954	2.5	14.2	1957	8.3	1957	61	44	40	57	13.8	SW	73	W	1949	61	6.2	8	8	15	6	1	*	1	0	1	10	*	254
N	44.2	24.4	34.3	72	1962	-15	1970	921	0.75	2.27	1955	0.02	1954	0.97	1946	7.5	22.1	1955	10.8	1946	64	54	53	61	15.1	SW	73	SW	1955	46	7.2	5	7	18	7	3	*	2	0	4	20	2	151
D	35.8	18.8	27.3	61	1962	-43	1968	1169	0.60	1.73	1965	T	1954	0.69	1941	8.3	25.0	1945	9.8	1945	66	62	61	65	16.0	SW	82	SW	1956	47	7.1	5	8	18	7	3	*	1	0	12	27	8	111
YR	56.9	32.8	44.7	106	AUG. 1969+	-43	DEC. 1968	7750	14.07	8.13	MAY 1953	T	OCT. 1965+	3.20	MAY 1953	56.2	35.4	APR. 1967	11.0	FEB. 1951+	65	49	44	59	13.1	SW	82	SW	DEC. 1956	64	6.4	86	103	176	99	19	27	13	23	51	154	29	356

ØFor period March 1961 through current year.
Means and extremes above are from existing and comparable exposures. Annual extremes have been exceeded at other sites in the locality as follows:
Highest temperature 107 in July 1933; lowest temperature -49 in February 1936; maximum precipitation in 24 hours 3.36 in June 1907; maximum snowfall in 24 hours 14.0 in December 1932.

(a) Length of record, years, based on January data. Other months may be for more or fewer years if there have been breaks in the record.
(b) Climatological standard normals (1931-1960).
* Less than one half.
\+ Also on earlier dates, months, or years.
T Trace, an amount too small to measure.
Below zero temperatures are preceded by a minus sign.
The prevailing direction for wind in the Normals, Means, and Extremes table is from records through 1963.
‡ ≥ 70° at Alaskan stations.

Unless otherwise indicated, dimensional units used in this bulletin are: temperature in degrees F.; precipitation, including snowfall, in inches; wind movement in miles per hour; and relative humidity in percent. Heating degree day totals are the sums of negative departures of average daily temperatures from 65° F. Cooling degree day totals are the sums of positive departures of average daily temperatures from 65° F. Sleet was included in snowfall totals beginning with July 1948. The term "Ice pellets" includes solid grains of ice (sleet) and particles consisting of snow pellets encased in a thin layer of ice. Heavy fog reduces visibility to 1/4 mile or less.

Sky cover is expressed in a range of 0 for no clouds or obscuring phenomena to 10 for complete sky cover. The number of clear days is based on average cloudiness 0-3, partly cloudy days 4-7, and cloudy days 8-10 tenths.

Solar radiation data are the averages of direct and diffuse radiation on a horizontal surface. The langley denotes one gram calorie per square centimeter.

& Figures instead of letters in a direction column indicate direction in tens of degrees from true North; i.e., 09 - East, 18 - South, 27 - West, 36 - North, and 00 - Calm. Resultant wind is the vector sum of wind directions and speeds divided by the number of observations. If figures appear in the direction column under "Fastest mile" the corresponding speeds are fastest observed 1-minute values.

To 8 compass points only.

AVERAGE TEMPERATURE

Year	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Annual
1932	23.8	30.1	25.2	47.9	56.8	63.3	71.3	67.9	58.8	46.2	38.6	21.0	45.9
1933	28.6	20.5	37.8	43.4	52.9	68.0	72.8	67.8	57.2	47.5	41.6	22.0	46.7
1934	35.2	35.0	37.6	51.7	62.0	62.1	70.9	68.2	52.4	50.8	41.6	27.6	49.6
1935	21.8	35.6	29.8	36.6	52.5	61.6	71.4	66.2	59.8	46.7	31.8	32.1	45.5
1936	19.8	-5.2	34.0	45.0	63.0	66.4	76.4	70.2	58.8	51.3	39.0	25.4	45.3
#1937	3.1	17.8	34.0	46.5	57.4	62.3	72.6	68.0	58.9	52.7	34.0	26.0	44.4
1938	31.0	18.2	34.2	45.8	52.1	61.9	69.3	67.2	65.5	50.2	33.0	29.3	46.5
#1939	32.8	18.7	36.0	48.4	57.7	57.0	72.8	69.6	59.9	47.6	45.2	36.6	48.5
1940	15.8	22.7	36.6	41.1	57.4	64.6	71.3	70.4	62.4	51.6	27.2	32.8	46.2
1941	28.6	28.4	34.6	45.4	55.5	62.4	71.3	67.6	51.8	46.2	39.5	28.5	46.6
1942	27.6	20.0	33.3	47.0	50.4	56.8	69.3	67.2	57.2	50.1	33.3	28.2	45.0
1943	11.7	30.1	24.9	49.6	50.4	56.6	69.4	68.1	59.2	52.1	39.3	32.8	45.4
1944	33.3	24.0	25.2	47.2	57.2	57.8	67.6	64.8	59.4	55.4	33.8	28.6	46.2
1945	28.6	23.6	35.7	38.8	51.1	56.8	71.7	70.2	54.6	51.6	33.4	24.0	45.0
1946	31.6	32.1	41.0	50.0	51.0	61.4	70.6	66.7	57.0	40.5	28.1	26.8	46.4
1947	25.8	23.2	27.5	46.0	55.1	58.3	73.2	66.8	56.6	51.7	30.2	31.0	45.4
1948	29.3	19.9	27.2	43.2	53.0	61.3	66.4	68.6	60.0	50.6	35.6	18.4	44.5
1949	10.0	18.8	31.2	51.0	56.8	61.2	68.8	71.0	58.4	41.5	47.5	19.8	44.7
1950	-3.8	35.3	28.5	40.7	50.8	58.5	66.3	64.5	55.8	49.2	31.7	33.0	42.5
1951	18.2	23.7	19.1	40.8	53.1	54.1	68.2	62.7	52.6	42.0	35.5	15.2	40.5
1952	18.3	27.5	28.0	50.9	54.8	61.2	66.5	66.3	61.3	50.2	33.6	32.5	45.9
1953	32.4	31.2	36.0	38.2	49.1	58.5	70.0	69.1	60.9	54.2	44.8	32.5	48.1
1954	10.2	39.8	25.9	37.0	53.5	56.8	71.5	65.1	55.8	45.8	44.7	34.6	45.0
1955	25.9	21.6	23.0	40.5	49.5	60.4	67.0	70.3	56.0	50.4	19.4	22.3	42.2
1956	20.8	23.5	33.8	41.4	54.3	63.8	69.4	65.1	58.8	47.7	38.3	29.2	45.5
1957	7.9	22.4	33.8	42.8	56.4	61.9	71.8	65.6	59.3	40.7	35.0	36.6	44.5
1958	36.6	23.6	28.1	44.0	61.9	58.9	63.8	71.2	58.5	52.2	33.3	29.9	46.8
1959	23.1	16.9	38.1	43.4	48.5	63.0	70.8	65.8	55.7	44.8	29.7	36.0	44.7
1960	22.8	23.9	31.3	42.8	52.3	62.2	74.5	65.5	60.2	50.2	35.5	30.2	46.0
#1961	32.8	36.0	37.7	40.3	54.8	69.4	70.2	72.4	50.2	46.6	30.0	20.3	46.7
1962	19.0	20.7	25.9	48.1	50.8	61.4	65.0	67.3	56.7	50.5	40.3	32.6	44.8
1963	12.8	36.8	39.4	42.9	52.9	61.4	68.9	68.8	64.0	54.1	38.6	23.5	47.0
1964	28.7	33.0	26.9	42.3	54.8	62.5	72.4	65.4	53.9	53.0	31.9	11.2	44.7
1965	23.9	27.0	20.9	44.7	51.5	60.3	69.6	68.0	49.0	53.4	34.9	29.1	44.0
1966	13.9	27.1	36.4	40.2	55.8	59.9	70.0	65.1	64.2	47.4	29.0	27.9	44.8
1967	26.3	32.1	27.2	35.5	52.5	60.2	73.0	71.0	62.9	50.2	36.2	22.1	45.8
1968	22.0	33.2	40.5	40.6	49.5	59.2	67.8	64.4	56.5	48.0	35.8	16.1	44.5
1969	-2.8	16.6	26.2	50.3	55.8	59.3	68.3	72.1	61.3	38.1	40.1	29.9	42.9
1970	14.7	32.3	29.0	38.5	53.8	66.5	71.4	70.9	54.6	44.7	30.2	23.0	44.1
1971	16.2	29.4	31.6	45.0	54.6	62.0	67.5	76.0	54.7	44.7	36.3	18.0	44.6
RECORD MEAN	21.4	26.3	31.0	43.7	53.5	60.5	69.6	68.0	57.7	48.5	35.1	27.1	45.2
MAX	30.5	35.9	41.0	54.7	65.1	71.9	83.6	82.0	69.9	59.3	44.1	35.8	56.2
MIN	12.2	16.6	21.0	32.6	41.9	49.1	55.5	53.9	45.5	37.6	26.0	18.4	34.2

TOTAL DEGREE DAYS

GREAT FALLS, MONTANA

Season	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	Total
1937-38	7	39	206	387	931	1209	1058	1312	954	573	404	118	7198
1938-39	17	45	55	462	962	1107	1000	1299	902	506	251	255	6861
#1939-40	7	43	178	540	594	879	1527	1224	880	716	251	106	6945
1940-41	16	16	132	419	1129	1001	1131	1025	939	586	309	141	6844
1941-42	4	63	391	585	763	1135	1158	1262	980	544	455	248	7588
1942-43	29	67	251	474	950	1141	1649	975	1240	459	458	254	7947
1943-44	36	20	194	414	775	997	985	1187	1234	533	263	243	6881
1944-45	52	63	204	298	935	1133	1130	1157	910	786	431	277	7376
1945-46	13	12	353	423	949	1267	1037	921	741	448	433	137	6734
1946-47	12	67	271	761	1111	1182	1217	1170	1165	567	315	207	8045
1947-48	0	55	294	418	1043	1050	1104	1309	1168	652	373	158	7624
1948-49	39	13	199	445	877	1445	1703	1294	1050	418	275	151	7909
1949-50	20	12	214	731	524	1398	2135	826	1126	724	435	216	8361
1950-51	53	60	310	486	994	989	1449	1149	1422	720	365	326	8323
1951-52	61	136	368	709	878	1538	1441	1083	1136	425	309	129	8213
1952-53	62	65	129	450	934	1001	1005	942	890	796	485	203	6962
1953-54	21	17	155	330	600	1000	1696	701	1204	835	363	259	7181
1954-55	18	59	280	588	604	937	1204	1211	1297	728	475	162	7563
1955-56	88	8	300	444	1364	1318	1363	1198	960	700	341	94	8178
1956-57	40	77	203	532	790	1107	1770	1189	962	661	259	124	7714
1957-58	7	69	197	750	894	877	874	1153	1138	623	144	194	6920
1958-59	106	13	235	400	944	1081	1297	1347	828	637	505	109	7502
1959-60	26	67	310	621	1055	890	1301	1187	1041	660	409	114	7681
#1960-61	11	78	187	455	878	1073	989	807	839	732	326	14	6389
1961-62	4	9	449	566	1043	1378	1426	1236	1208	501	432	140	8392
1962-63	55	57	250	445	734	997	1615	786	788	655	381	144	6907
1963-64	23	23	103	338	782	1279	1118	923	1176	674	318	118	6875
1964-65	0	93	337	375	990	1666	1271	1055	1361	602	411	164	8325
1965-66	17	54	594	355	894	1106	1585	1054	880	736	304	182	7761
1966-67	7	85	101	537	1075	1143	1190	914	1166	878	396	168	7660
1967-68	2	8	136	453	838	1327	1329	914	753	724	472	198	7174
1968-69	38	93	261	520	867	1311	2104	1350	1198	432	292	199	8865
1969-70	27	8	172	828	743	1081	1959	908	1108	785	345	95	7659
1970-71	9	8	319	625	1036	1296	1509	993	1031	594	320	134	7874
1971-72	34	5	326	628	854	1455							

TOTAL PRECIPITATION

Year	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Annual
1932	0.15	0.73	2.23	1.57	1.19	4.07	1.78	4.95	T	0.86	0.73	1.12	19.38
1933	0.38	0.80	0.14	1.12	2.13	1.84	0.90	5.34	0.89	0.88	0.79	1.04	16.25
1934	0.52	0.30	1.90	0.65	1.06	3.25	1.83	0.16	2.36	0.96	0.23	0.81	14.03
1935	0.27	0.32	1.38	1.11	0.87	1.23	0.43	0.50	0.52	0.46	0.21	0.15	7.45
1936	0.59	1.29	0.43	0.71	1.18	2.12	0.19	0.43	1.17	0.34	0.15	0.56	9.16
#1937	0.55	0.16	0.51	0.22	0.27	3.20	1.43	0.61	1.17	0.33	0.43	0.78	9.66
1938	0.03	0.56	0.46	0.27	3.72	4.52	1.00	1.64	0.75	1.55	0.32	0.02	14.84
#1939	0.29	0.33	0.24	0.88	1.52	2.41	0.66	0.59	1.30	1.21	0.15	0.31	9.89
1940	0.62	0.69	0.83	1.78	2.10	0.91	0.73	0.05	2.24	0.83	1.13	0.18	12.09
1941	0.29	0.36	0.55	1.34	2.07	3.67	2.27	0.68	3.56	0.55	1.11	1.19	17.64
1942	0.46	1.02	0.85	0.35	4.64	2.44	1.50	0.67	1.06	0.56	0.94	0.08	14.53
1943	1.48	0.62	0.51	1.36	1.03	5.32	1.01	0.64	0.61	0.57	0.39	0.42	13.96
1944	T	1.44	1.47	0.75	1.15	3.88	1.24	1.44	1.31	0.04	0.99	0.50	14.21
1945	0.32	0.53	0.76	0.67	1.49	3.24	0.20	0.85	2.60	0.80	0.32	1.73	13.51
1946	0.10	0.12	0.42	0.48	1.70	1.96	1.92	1.18	1.93	1.53	1.78	0.86	13.98
1947	0.50	0.71	1.47	0.40	0.68	3.42	0.26	0.30	2.52	0.54	1.11	0.44	12.35
1948	1.23	0.36	1.42	0.61	3.43	4.84	2.28	0.50	0.72	0.08	0.39	0.53	16.39
1949	1.40	0.79	1.11	0.41	3.21	1.54	0.94	0.27	0.52	0.90	0.05	0.53	11.67
1950	0.91	0.01	2.14	1.47	0.67	2.76	3.54	2.94	0.31	0.03	1.19	0.58	16.55
1951	0.41	1.34	1.22	2.50	2.23	3.57	2.54	2.50	1.44	1.72	0.41	1.71	21.59
1952	0.34	1.63	0.76	0.30	1.57	1.22	0.15	1.21	0.24	0.16	1.36	0.08	9.02
1953	0.55	1.46	0.74	1.85	8.13	5.06	0.06	0.56	1.14	0.09	0.13	0.98	20.75
1954	1.23	0.21	1.01	0.86	1.17	4.71	0.63	2.63	1.86	1.35	0.02	T	15.68
1955	0.80	1.47	1.53	2.48	4.26	1.23	4.32	0.04	0.16	0.54	2.27	0.55	19.65
1956	0.52	0.37	0.38	0.53	1.33	2.58	1.02	1.68	0.44	1.02	0.30	0.59	10.76
1957	1.80	0.73	0.77	0.95	2.82	2.94	0.75	1.11	1.68	1.89	0.61	0.11	16.16
1958	0.56	2.16	1.24	0.67	1.09	4.68	2.32	0.42	0.28	0.31	1.24	1.17	16.14
1959	1.57	1.00	0.58	0.36	2.94	1.88	0.04	0.37	1.55	1.20	1.71	0.43	13.63
1960	0.28	0.52	0.15	2.13	1.71	0.52	0.39	2.66	0.43	0.04	0.79	0.19	9.81
1961	0.22	0.19	0.88	0.96	1.80	0.73	1.01	0.63	1.95	0.32	1.49	0.30	10.48
1962	1.28	0.95	0.74	0.58	5.18	2.30	1.09	1.69	0.10	1.17	0.36	0.51	15.95
1963	1.71	0.32	0.35	1.24	1.27	2.88	0.96	0.49	0.87	0.63	0.21	1.02	11.95
1964	0.65	0.52	1.74	1.91	3.36	4.34	1.50	1.66	0.28	T	0.72	1.23	17.91
1965	0.84	1.18	0.79	2.51	1.47	5.37	1.03	1.58	1.90	T	1.13	0.59	18.39
1966	1.63	0.51	0.79	0.74	1.54	2.17	1.81	0.77	0.21	1.32	1.62	0.99	14.10
1967	1.12	0.28	2.18	3.69	2.17	3.65	0.91	0.23	1.59	1.13	0.26	1.47	18.68
1968	1.29	0.24	0.90	1.11	2.64	2.89	0.06	2.16	2.92	0.11	0.68	1.36	16.36
1969	2.03	0.40	0.44	0.38	1.14	5.33	1.11	0.03	0.13	0.89	0.11	0.40	12.41
1970	0.99	1.02	1.14	1.88	3.16	2.32	1.16	0.77	0.67	1.00	0.53	0.70	15.34
1971	1.22	0.65	1.12	0.66	3.03	0.62	0.27	1.16	0.61	0.30	0.36	1.48	11.48
RECORD MEAN	0.84	0.73	0.93	1.15	2.39	3.00	1.20	1.06	1.17	0.72	0.77	0.68	14.64

TOTAL SNOWFALL

Season	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	Total
1932-33	0.0	0.0	0.0	3.5	6.0	19.6	4.0	11.4	1.0	3.0	0.0	0.0	48.5
1933-34	0.0	0.0	T	5.0	7.8	13.9	5.0	2.8	20.2	4.0	0.0	0.0	58.7
1934-35	0.0	0.0	13.2	T	1.3	4.3	3.3	3.9	18.3	7.6	0.0	0.0	51.9
1935-36	0.0	0.0	0.0	1.4	0.5	1.5	7.0	15.5	6.4	1.5	0.0	0.0	33.8
#1936-37	0.0	0.0	0.0	1.5	3.0	10.4	14.8	2.5	5.0	2.0	0.0	0.0	39.2
1937-38	0.0	0.0	0.0	T	8.3	9.0	2.0	15.0	9.8	1.0	T	0.0	45.1
1938-39	0.0	0.0	0.0	T	3.4	0.2	3.9	4.5	5.4	1.4	T	0.0	18.8
#1939-40	0.0	0.0	T	T	T	5.8	5.1	7.9	5.8	4.3	T	0.0	28.9
1940-41	0.0	0.0	0.0	T	12.7	2.6	4.7	5.7	4.1	6.6	0.0	0.0	36.4
1941-42	0.0	0.0	7.1	2.8	9.4	15.4	6.7	14.0	8.8	0.3	0.2	0.0	64.4
1942-43	0.0	0.0	T	0.3	13.0	1.1	20.3	8.2	6.9	0.8	3.5	T	54.1
1943-44	0.0	0.0	2.0	2.3	3.5	3.0	T	15.8	16.3	T	T	0.0	42.9
1944-45	0.0	0.0	T	0.0	10.4	7.6	5.7	8.5	5.5	1.1	T	T	38.8
1945-46	0.0	0.0	0.6	4.8	2.0	25.0	1.9	2.2	1.0	T	T	0.0	37.5
1946-47	0.0	0.0	0.0	3.1	17.5	13.2	8.4	10.0	14.7	2.1	0.0	0.0	69.0
1947-48	0.0	0.0	6.4	T	11.1	5.4	12.9	4.3	15.3	5.6	2.4	0.0	63.4
1948-49	0.0	0.0	T	T	3.3	5.8	15.8	10.3	13.8	T	5.4	0.0	54.4
1949-50	0.0	0.0	2.0	7.4	T	7.2	13.2	0.2	20.6	11.1	2.3	11.1	75.1
1950-51	0.0	0.0	2.1	0.3	12.9	7.8	5.0	16.0	14.8	3.5	6.2	T	68.6
1951-52	0.0	0.0	0.6	10.9	4.3	22.9	4.5	19.7	7.4	0.2	0.0	0.0	70.5
1952-53	T	0.0	0.0	T	15.5	0.8	3.6	15.9	7.0	6.8	2.1	0.0	51.7
1953-54	0.0	0.0	0.0	T	T	10.2	15.5	2.0	13.8	10.1	0.8	T	52.4
1954-55	0.0	0.0	7.7	3.1	0.2	T	6.9	18.3	17.1	17.4	4.2	0.0	74.9
1955-56	0.0	0.0	T	2.0	22.1	7.4	6.4	3.0	2.7	4.3	8.1	0.0	56.0
1956-57	0.0	0.0	T	2.4	2.4	10.3	20.7	9.5	6.9	4.0	0.0	0.0	56.2
1957-58	0.0	0.0	3.6	14.2	5.7	0.7	5.3	26.1	15.9	1.2	0.0	0.0	72.7
1958-59	0.0	0.0	T	1.0	13.8	17.6	19.3	14.7	5.0	2.7	T	0.0	74.1
1959-60	0.0	0.0	0.8	8.9	16.6	4.5	3.1	6.1	1.9	16.2	1.7	0.0	59.8
1960-61	0.0	0.0	0.0	T	7.8	2.0	2.9	0.6	7.9	6.1	T	0.0	27.3
1961-62	0.0	0.0	0.4	2.6	15.0	3.0	14.7	8.9	5.9	3.8	T	0.0	54.3
1962-63	0.0	0.0	0.4	T	2.1	3.7	17.7	3.2	3.9	11.1	T	0.0	42.1
1963-64	0.0	0.0	0.0	0.0	2.1	10.6	8.5	5.7	17.4	13.2	T	0.0	57.5
1964-65	0.0	0.0	T	T	7.9	13.8	6.9	12.5	7.7	11.3	T	0.7	61.0
1965-66	0.0	0.0	4.2	0.0	9.7	6.5	16.9	5.8	7.7	6.0	T	0.0	56.8
1966-67	T	0.0	0.0	3.4	15.2	9.8	10.9	2.8	21.3	35.4	8.0	0.0	106.8
1967-68	0.0	0.0	0.0	0.7	2.4	14.9	12.8	1.9	7.6	6.1	T	0.0	46.4
1968-69	0.0	0.0	3.9	0.2	2.6	13.6	22.6	5.2	5.5	0.9	0.1	3.3	59.9
1969-70	0.0	0.0	0.0	5.0	1.1	4.3	9.4	11.4	10.9	18.7	1.4	0.0	62.2
1970-71	0.0	0.0	3.0	6.4	4.9	7.3	16.2	8.9	9.7	4.7	T	0.0	61.1
1971-72	0.0	0.0	T	3.8	4.2	19.2							

Record mean values above (not adjusted for instrument location changes listed in the Station Location table) are means for the period beginning in 1938.

# Indicates a break in the data sequence during the year, or season, due to a station move or relocation of instruments. See Station Location table. Data are from Cooperative locations through March 1937 and from Airport locations thereafter.

STATION LOCATION

GREAT FALLS; MONTANA

Location	Occupied from	Occupied to	Airline distance and direction from previous location	Latitude North	Longitude West	Elevation above Ground: Sea level (Ground at temperature site)	Ground: Wind instruments	Ground: Extreme thermometers	Ground: Psychrometer	Ground: Telepsychrometer	Ground: Tipping bucket rain gage	Ground: Weighing rain gage	Ground: 8" rain gage	Ground: Hygrothermometer	Sea level: Pyranometer	Remarks
COOPERATIVE																
End of Central Avenue Across Park Drive	11/01/91	6/30/98		47° 30'	111° 18'	3331		4					5			
Corner Central Avenue & Second Street	7/01/98	%	500 ft. E	47° 30'	111° 18'	3330		25					18			% - Sometime after 3/22/06; but before 7/15/13.
Post Office Grounds 1st Avenue N & 3rd Street	%	10/16/14	600 ft.NE	47° 31'	111° 18'	3328		4					3			
423 Fourth Avenue North	10/17/14	3/31/18	1400 ft.NNE	47° 31'	111° 18'	3334		4					3			
1709 Third Avenue North	4/01/18	9/30/19	5500 ft. E	47° 31'	111° 17'	3387		4					3			
412 Thirteenth Street North, Fire Station	10/01/19	3/31/37	2100 ft.WNW	47° 31'	111° 18'	3370		4					3			
AIRPORT																
Municipal Airport Gore Field, Wal Hangar 3.1 miles SW of P. O.	11/01/31	12/19/39		47° 29'	111° 22'	3654	35	4	4				3			SAWRS station to 11/1/36, then CAA.
Municipal Airport Gore Field, Administration Building	12/20/39	8/01/59	No Change	47° 29'	111° 22'	3664	b75	a18	a17		c15	c15	15		c 3697	Weather Bureau from 1/25/40. a - 16 feet 2/22/40 to 11/21/41. b - 63 feet to 6/30/42. c - Added 11/21/41.
International Airport Administration Building	8/01/59	Present	No Change	47° 29'	111° 22'	e3662	f22	18	17		15	15	15	d4	3692	d - Commissioned 2/4/61 1100 feet W of thermometer site. e - 3664 feet to 2/4/61. f - 23 feet to 11/10/64.

Requests for additional information should be directed to the National Weather Service Office for which this summary was issued.

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CONCEPTUAL DESIGN

CONCEPTUAL DESIGN THEORY

After reviewing the historical background of the Vocational-Technical school and the basic criteria for it in Great Falls, I have decided what I think the overall concept of the design should be and what should be followed in the design considerations.

I feel that the facility should have an industrial, but institutional character. I believe this because of the basic origin of the school and of the type of education offered by the school.

The Vocational-Technical school prepares the student in general terms, for jobs in industry or related fields of it. Industry not directly related to the factory worker on an assembly, but jobs that are related to the everyday way of life which is the only facility of its type that does this on a scale of this sort.

I felt that the facility should be identified with a Vocational-Technical school being that it is one. It should take on a different cahracter that the College of Great Falls because the two schools are located adjacent to each other and the two schools offer completely different types of education.

I also feel that if the schools have a different character, a sense of pride can be instilled in the student of the Vo-Tech school. He will feel that his education is housed in a facility all of its own and not borrowed form someplace else which seems to be the case in most instances with Vocational-Technical schools.

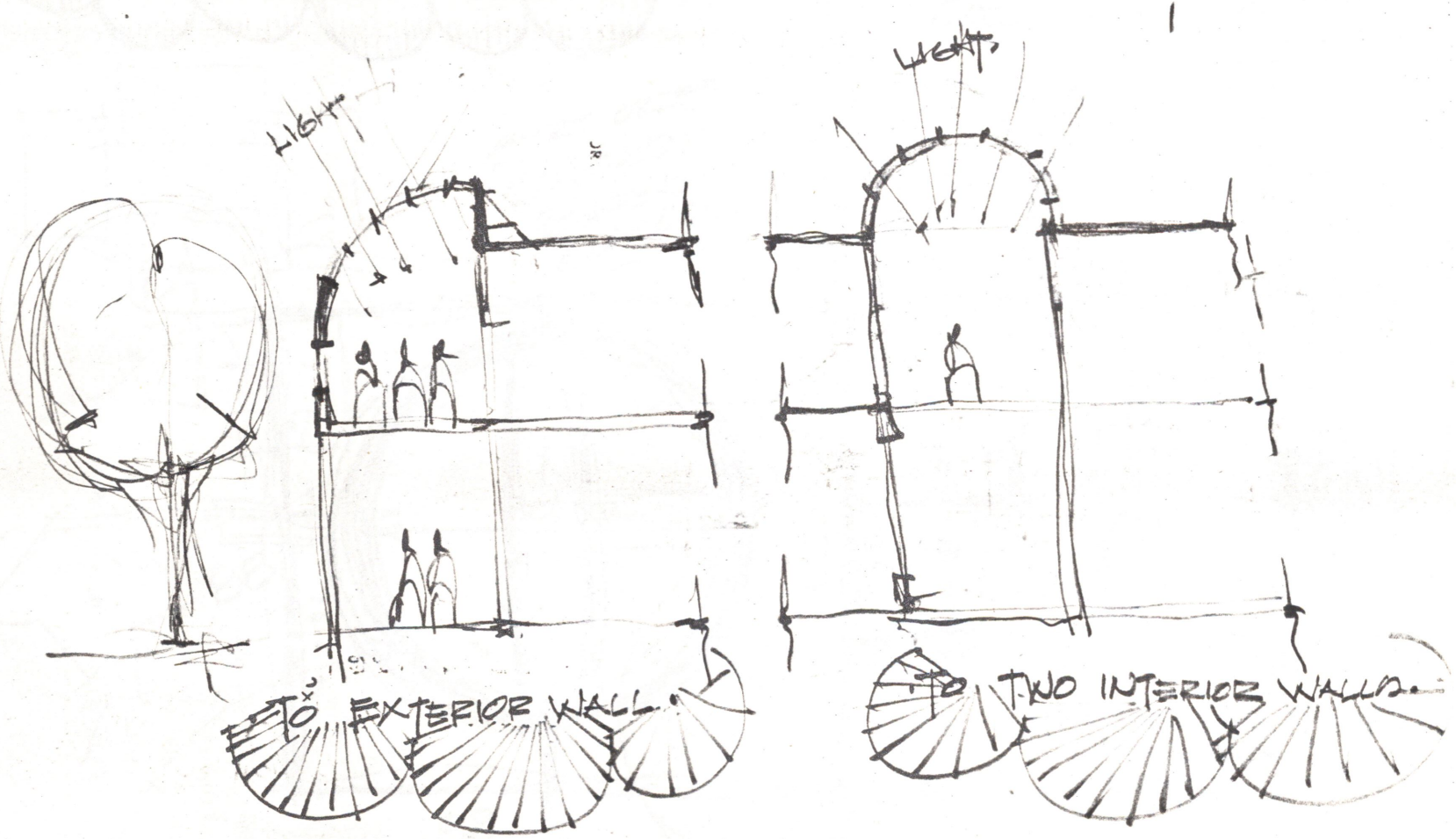
It is most important for the student to have a gathering place or "Great Space" for which the student can have meetings or relaxing, etc. This is a space which the student will remember after he leaves the school. I feel that not only can the one place within the school be the only thing that he remembers but the whole school can be a good memory for him. This is why I feel that articulation of the circulation areas within the school is very important. These are the gathering places, the conversation places, and the places that should be the most interesting for the student.

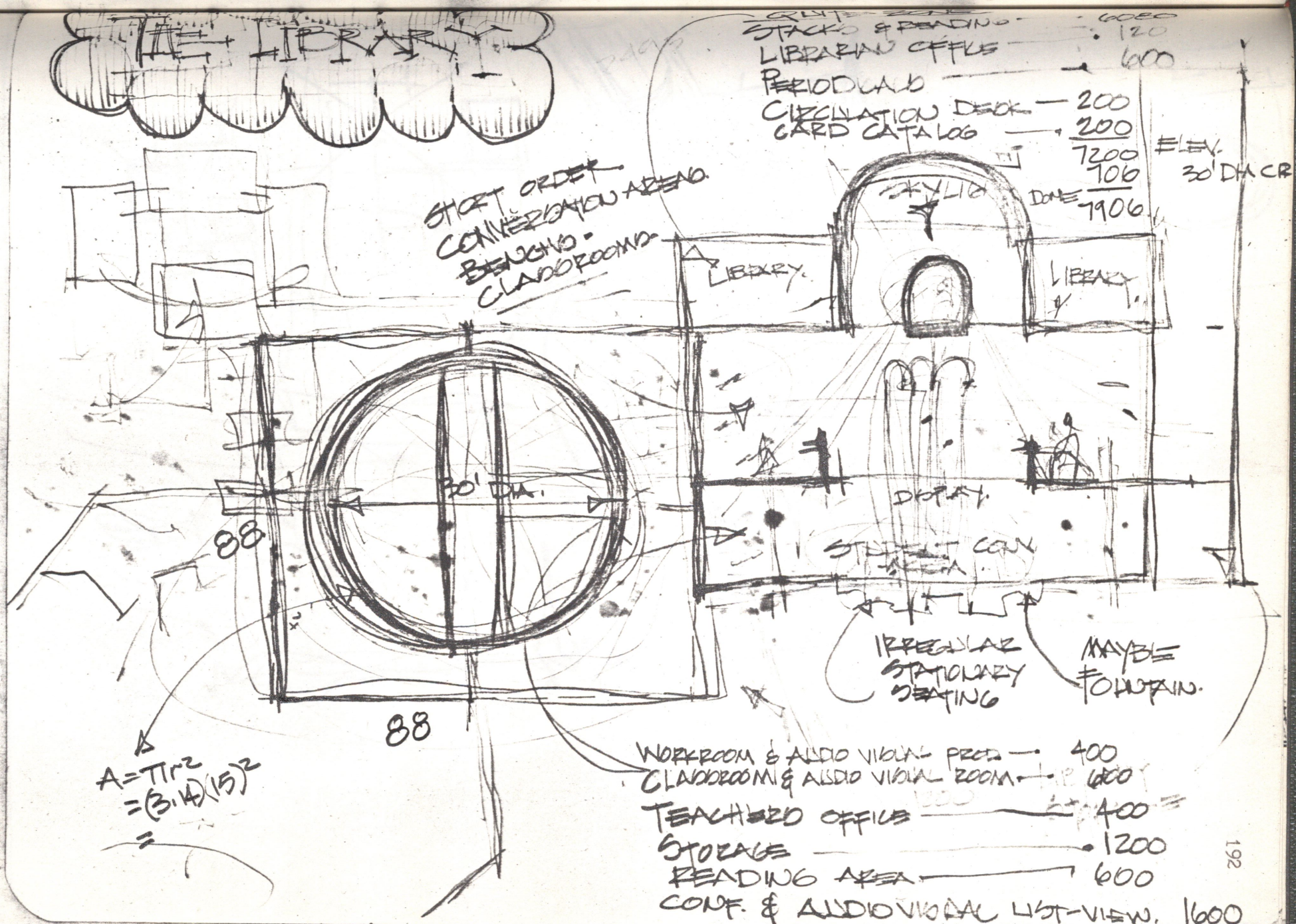
I want to design a facility that can be easily added onto and also that would not go "out of style". Industrial buildings and their general architectural character have been with us for a long time and they will continue to be with us for a long time to come.

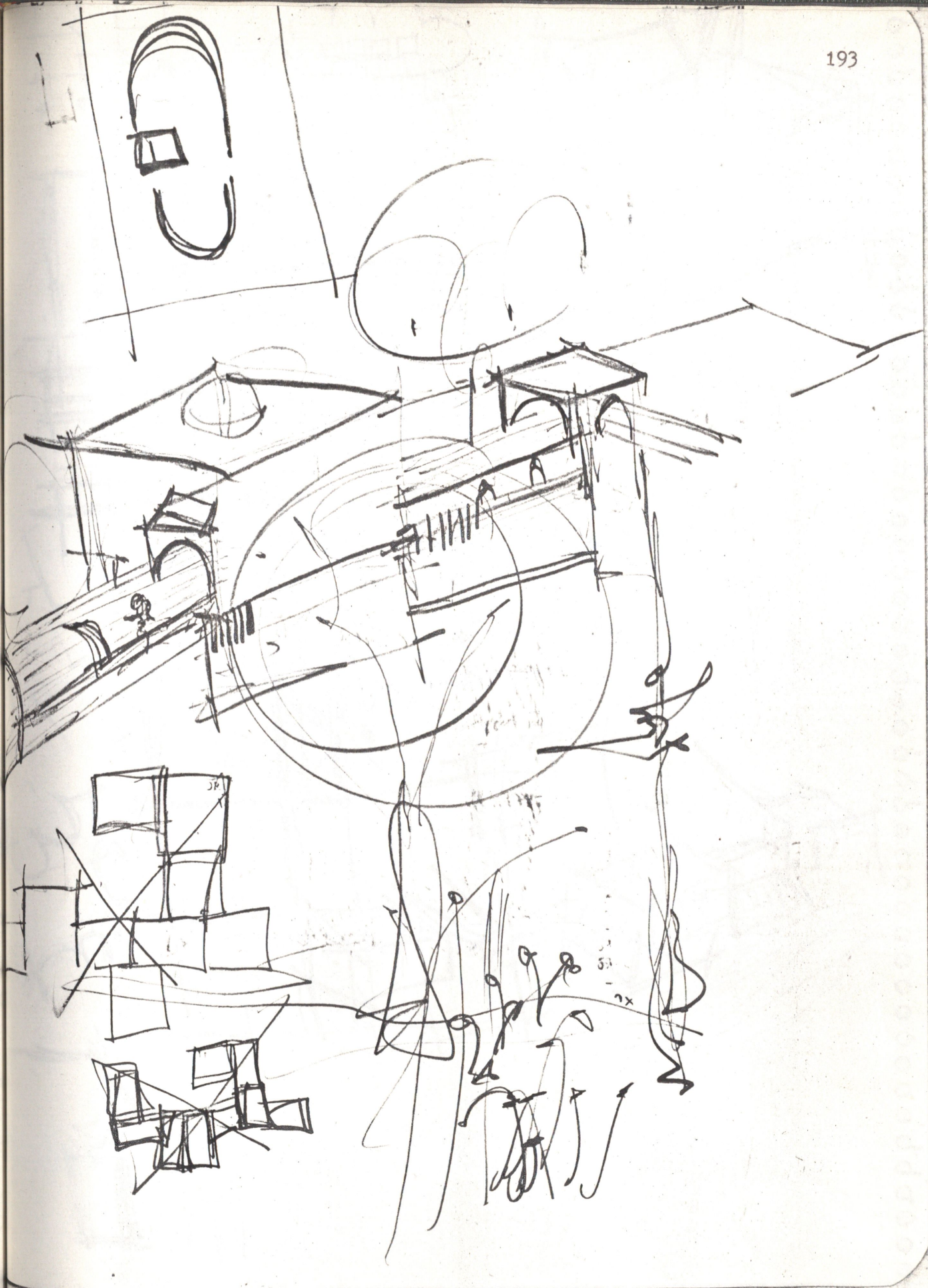
I want to design a facility that can be part of the learning process, therefore I will leave exposed ducts and structure, not only for the ease of expansion and flexibility of spaces but for the learning experience of the student of the Vo-Tech school.

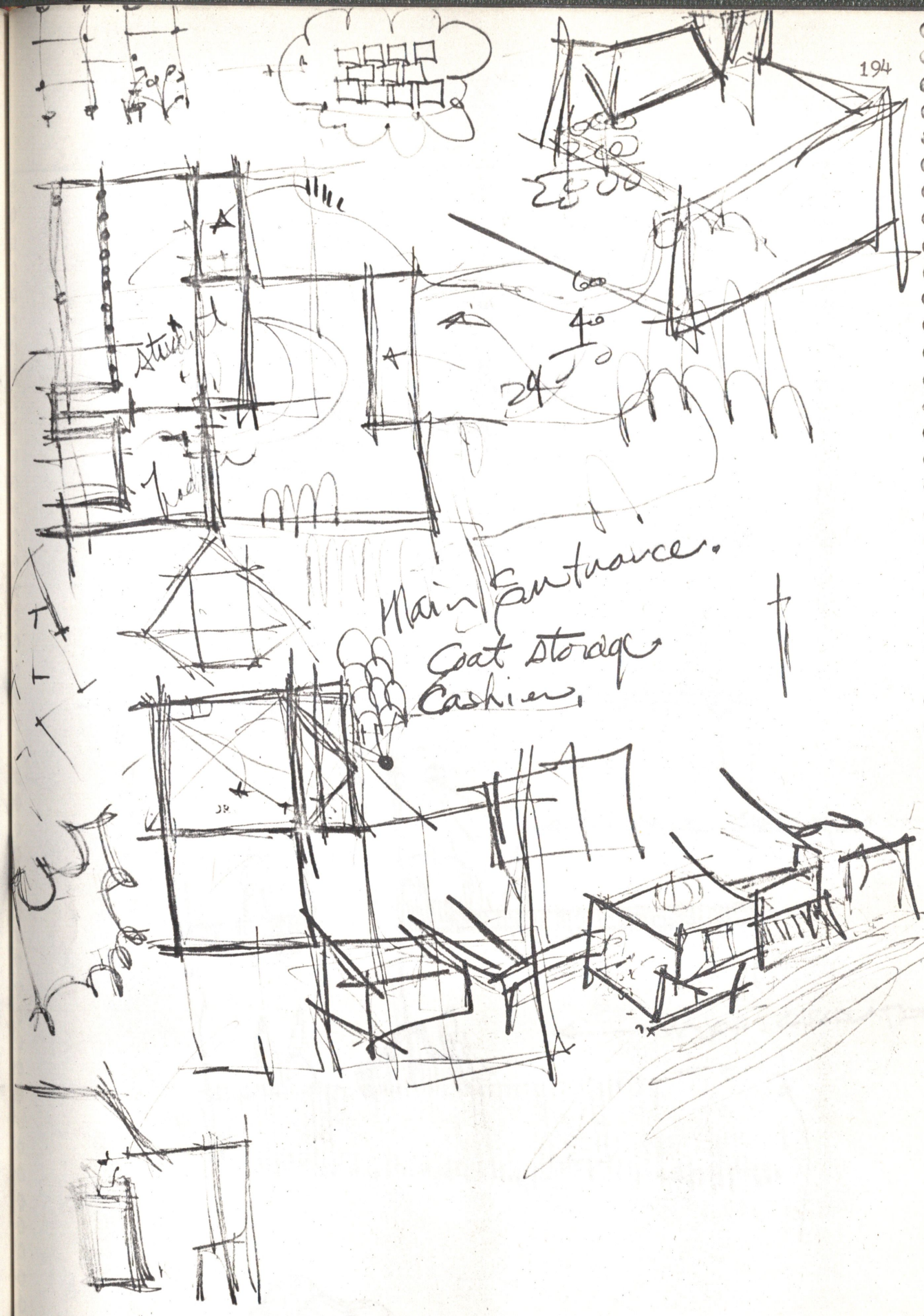
Because the school is open from 8:00 a.m. to 12:00 midnight, I feel it is important to have a visual experience of the activity of the building and of the general character of the complex after dark.

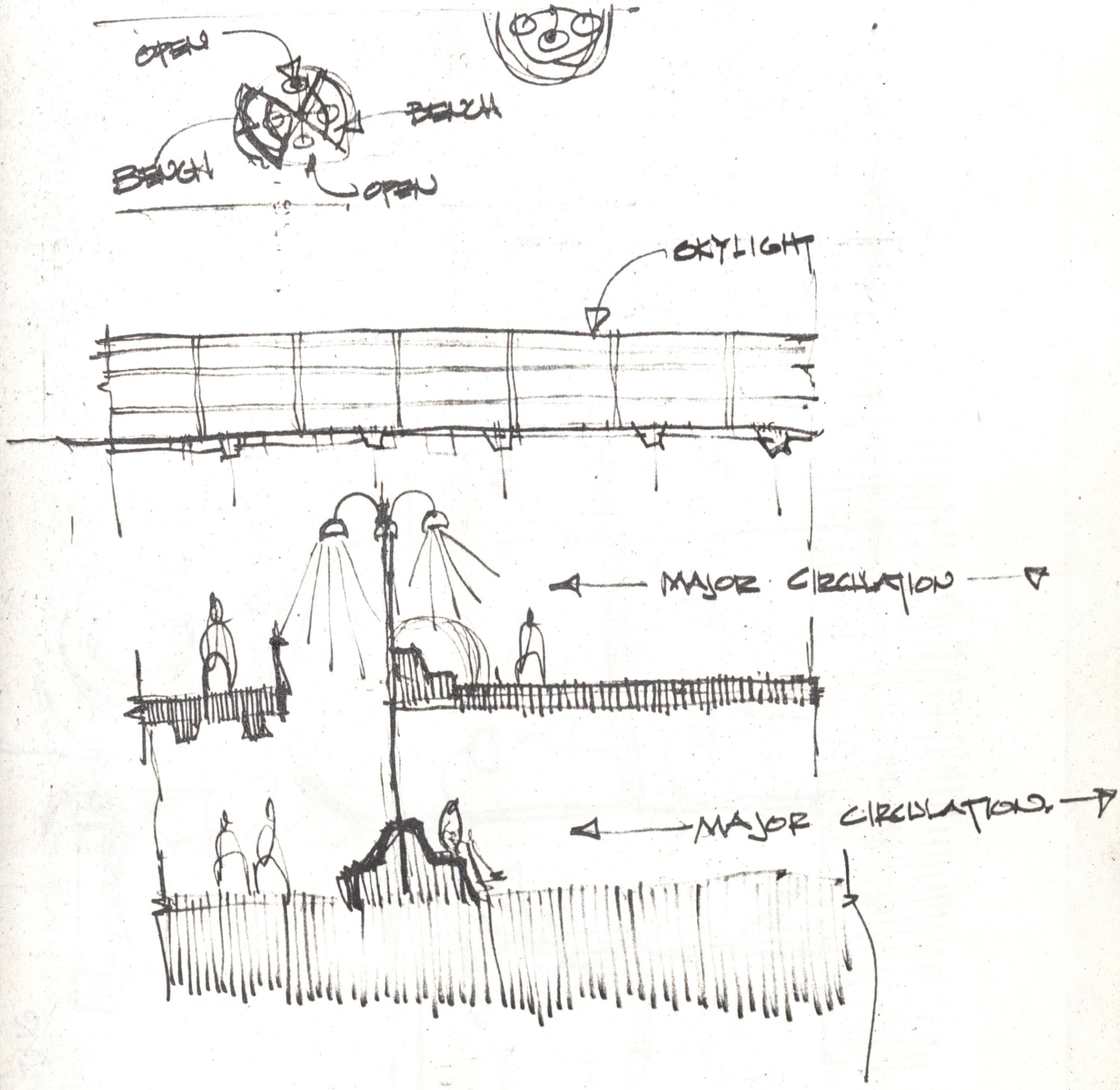
CIRCULATION AREAS.

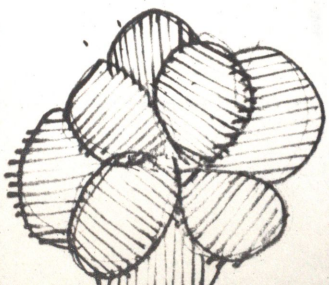



THE LIBRARY
QUIET ZONE
STACKS & READING — 6000
LIBRARIAN OFFICE — 120
PERIODICALS — 600
CIRCULATION DESK — 200
CARD CATALOG — 200
7200
706
DONE 7906
ELEV.
30' DIA CR
SKYLIG
LIBRARY.
LIBRARY
DISPLAY.
STREET CONN AREA.
IRREGULAR STATIONARY SEATING
MAYBE FOUNTAIN.
SHORT ORDER CONVERSATION AREAS.
BENCHES.
CLASSROOMS.
30' DIA.
88
88
A=πr²
=(3.14)(15)²
=
WORKROOM & AUDIO VISUAL PROD. — 400
CLASSROOMS & AUDIO VISUAL ROOM — 6000
TEACHERS OFFICE — 400
STORAGE — 1200
READING AREA — 600
CONF. & AUDIOVISUAL LIST-VIEW. 1600

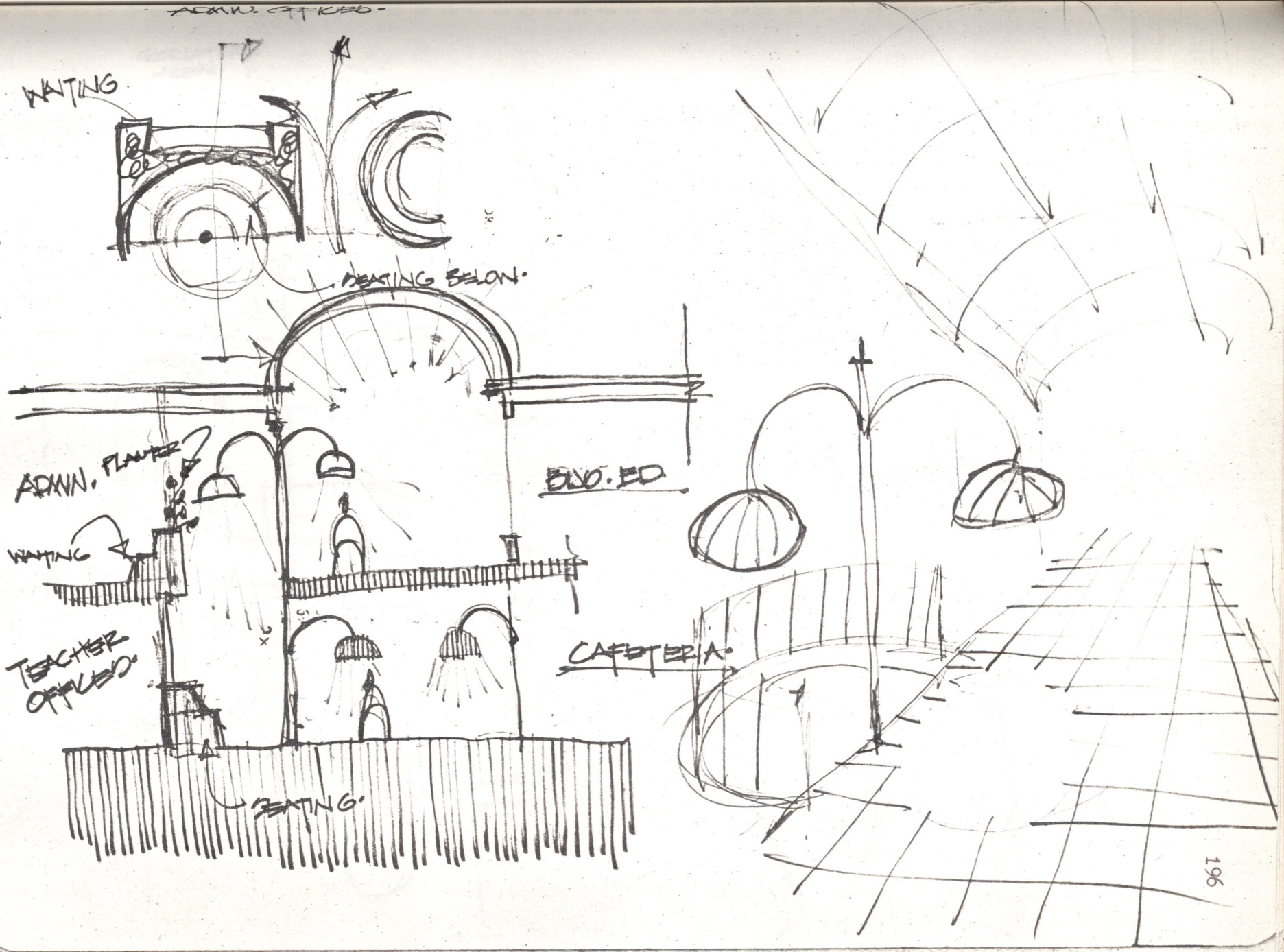


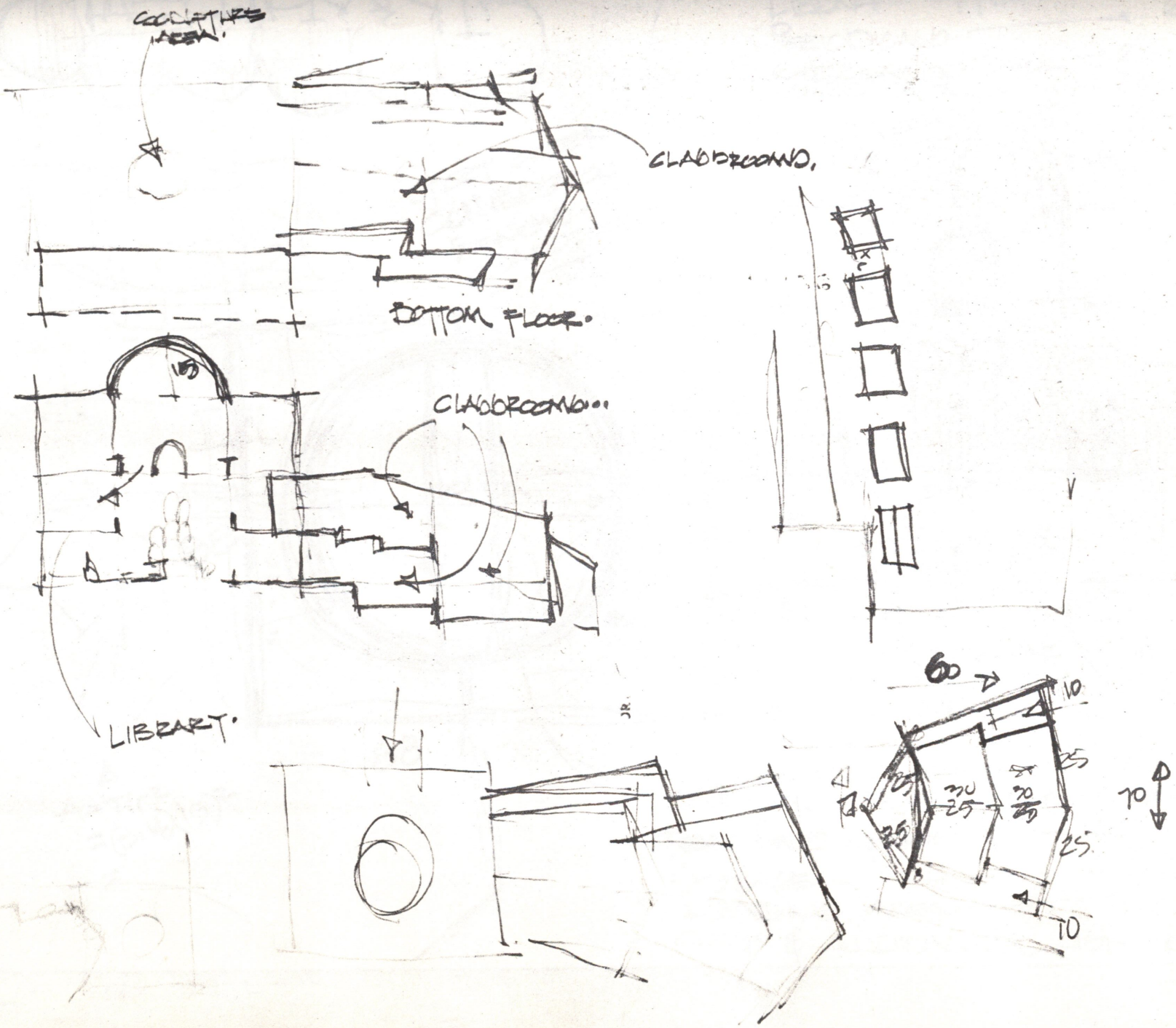

Main Entrance.
Coat storage
Cashier.

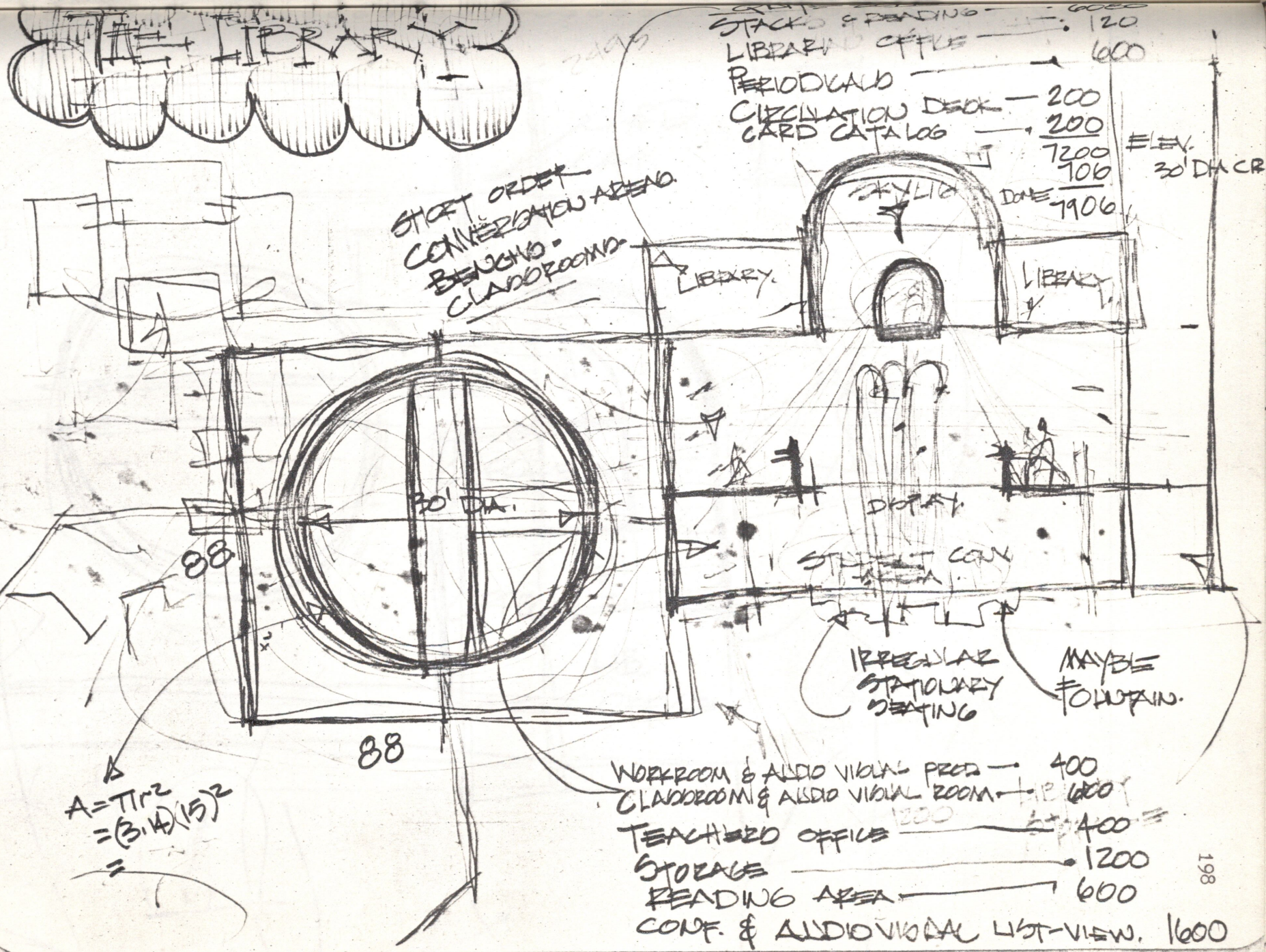


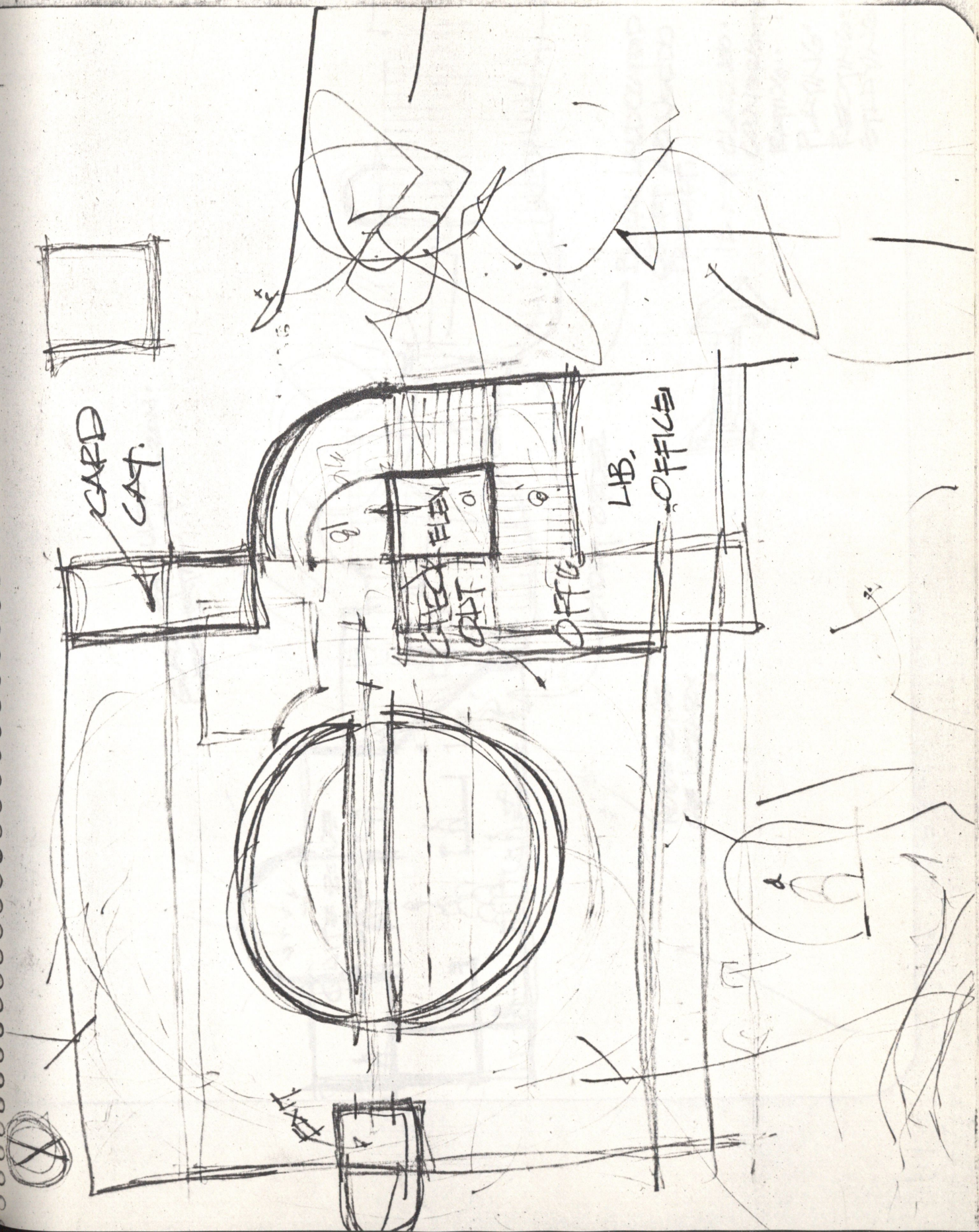


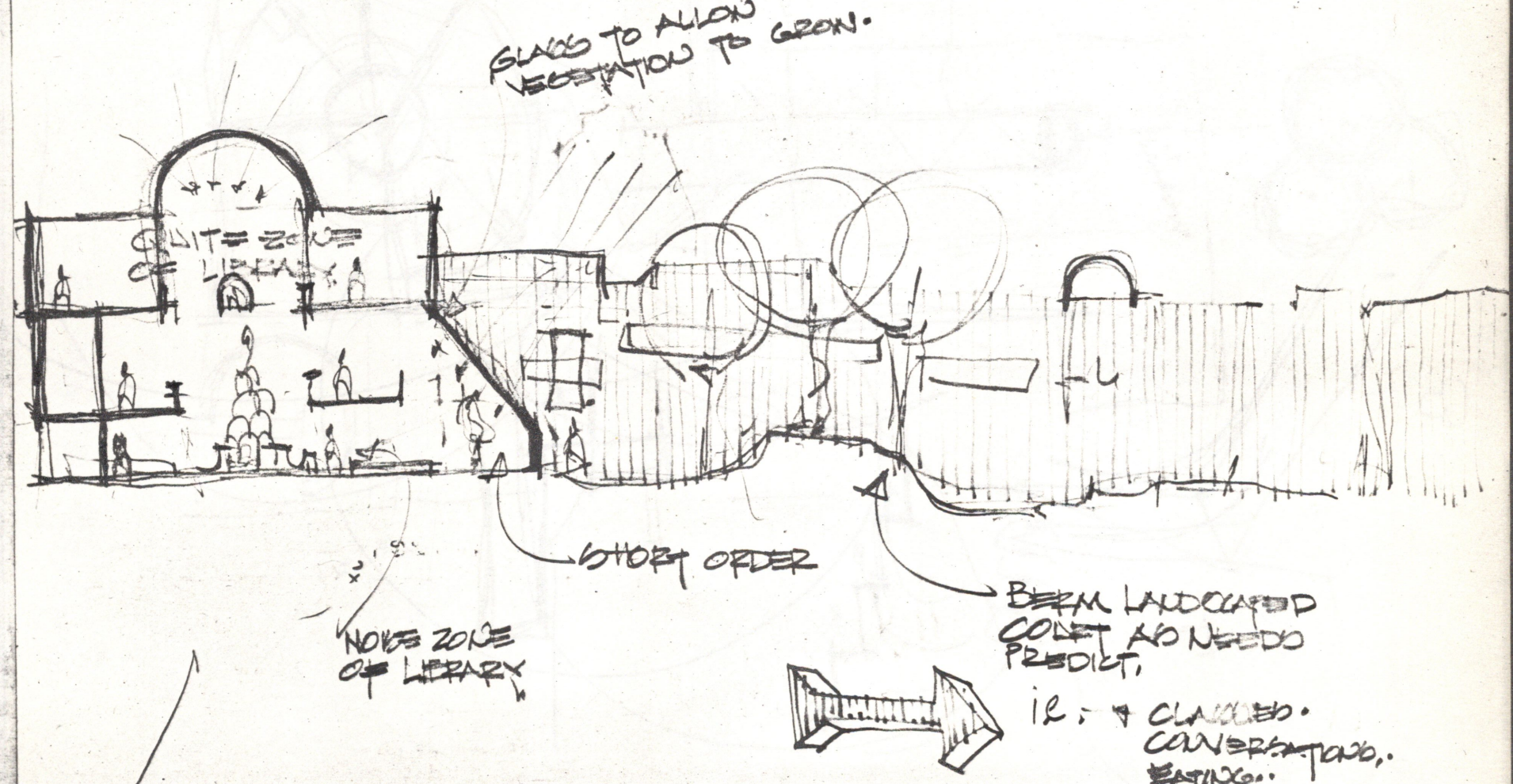
INTERIOR LIGHTING

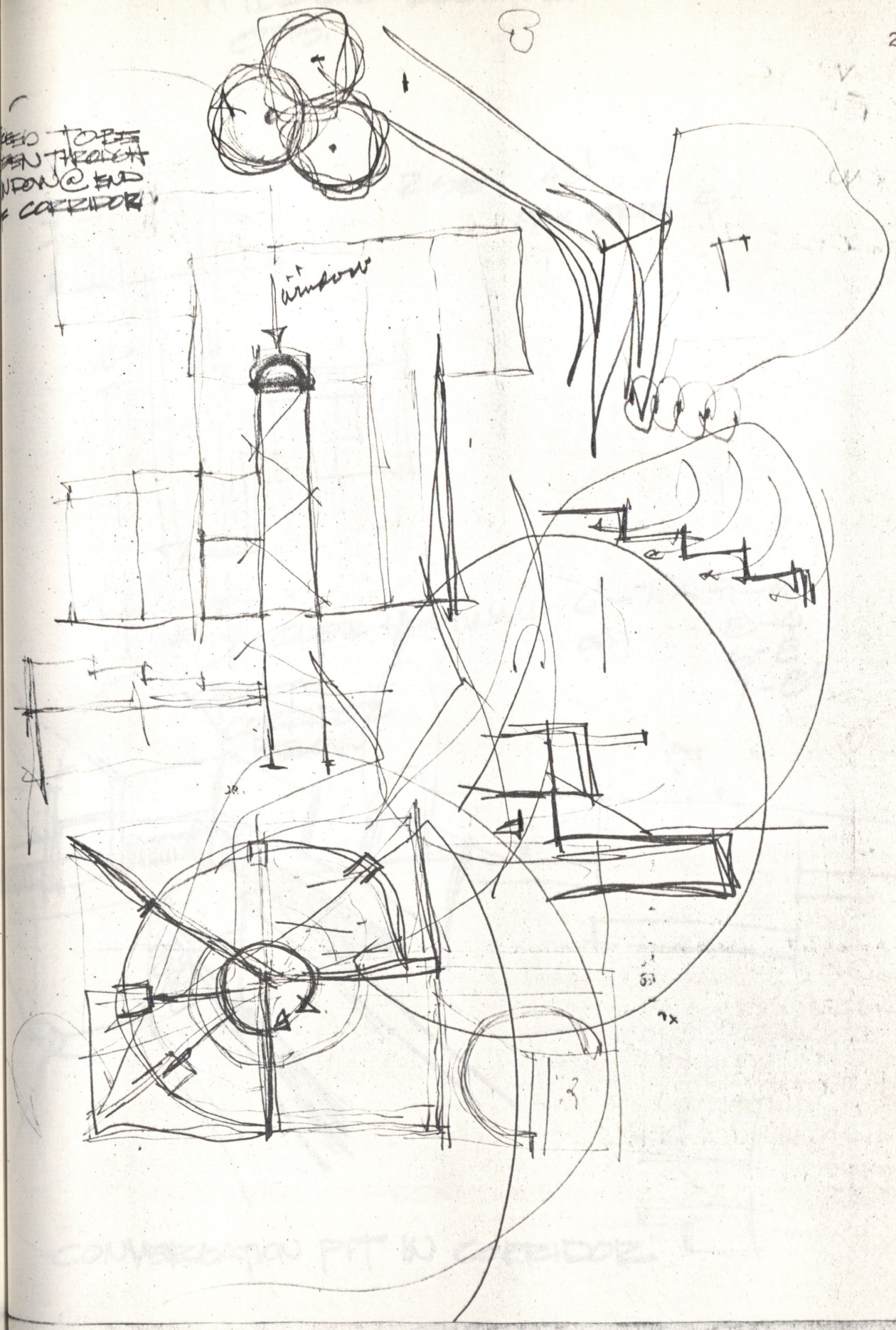

ADMIN. OFFICES.
WAITING
SEATING BELOW.
ADMIN. PLANTER
WAITING
TEACHER OFFICES.
BLVD. ED
CAFETERIA.
SEATING.


CLASSROOMS.
BOTTOM FLOOR.
CLASSROOMS..
LIBRARY.
60
10
25
30
20
70
10


THE LIBRARY
STACKS & READING — 6000
LIBRARY OFFICE — 120
PERIODICALS — 600
CIRCULATION DESK — 200
CARD CATALOG — 200
7200
106
DONE 7906
ELEV.
30' DIA CR
SKYLIT
LIBRARY
LIBRARY
START ORDER
CONVERSATION AREAS
BENCHES
CLASSROOMS
30' DIA.
88
88
DISPLAY
STREET CONN
IRREGULAR STATIONARY SEATING
MAYBE FOUNTAIN.
A=πr²
=(3.14)(15)²
=
WORKROOM & AUDIO VISUAL PROD — 400
CLASSROOM & AUDIO VISUAL ROOM — 600
TEACHERS OFFICE — 400
STORAGE — 1200
READING AREA — 600
CONF. & AUDIOVISUAL LIST-VIEW. 1600

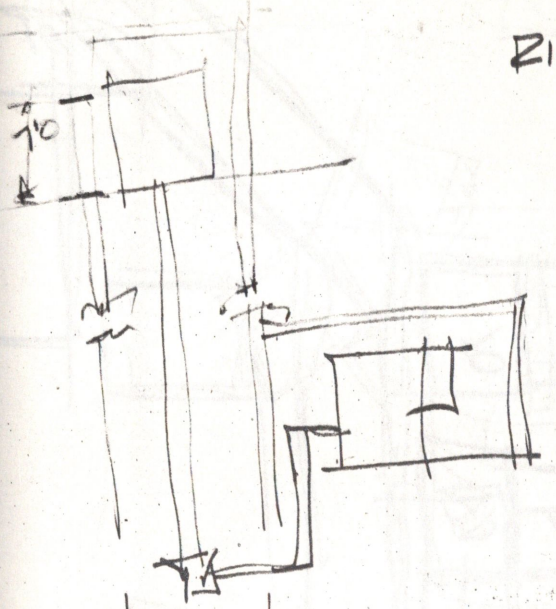

CARD CAT.
LIB. OFFICE
OFFICE
CHAIR


GLASS TO ALLOW VEGETATION TO GROW.
QUIET ZONE OF LIBRARY
STORY ORDER
BERM LANDSCAPED
COULET AS NEEDS PREDICT,
NOISE ZONE OF LIBRARY
ie: CLASSES.
CONVERSATIONS.
EATING.
PLAYING.
RESTING.
STUDYING.

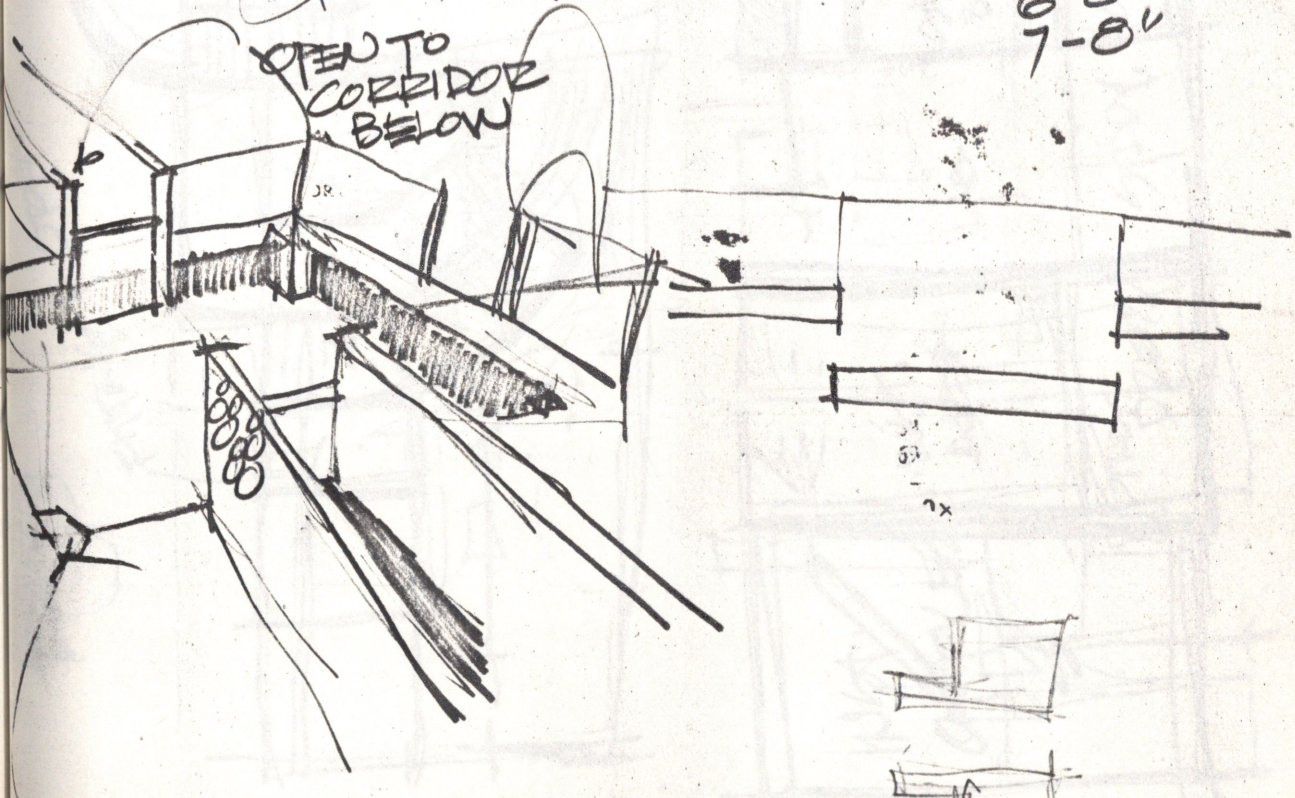

window

HYDRALIC ELEVATOR.
OTIS.

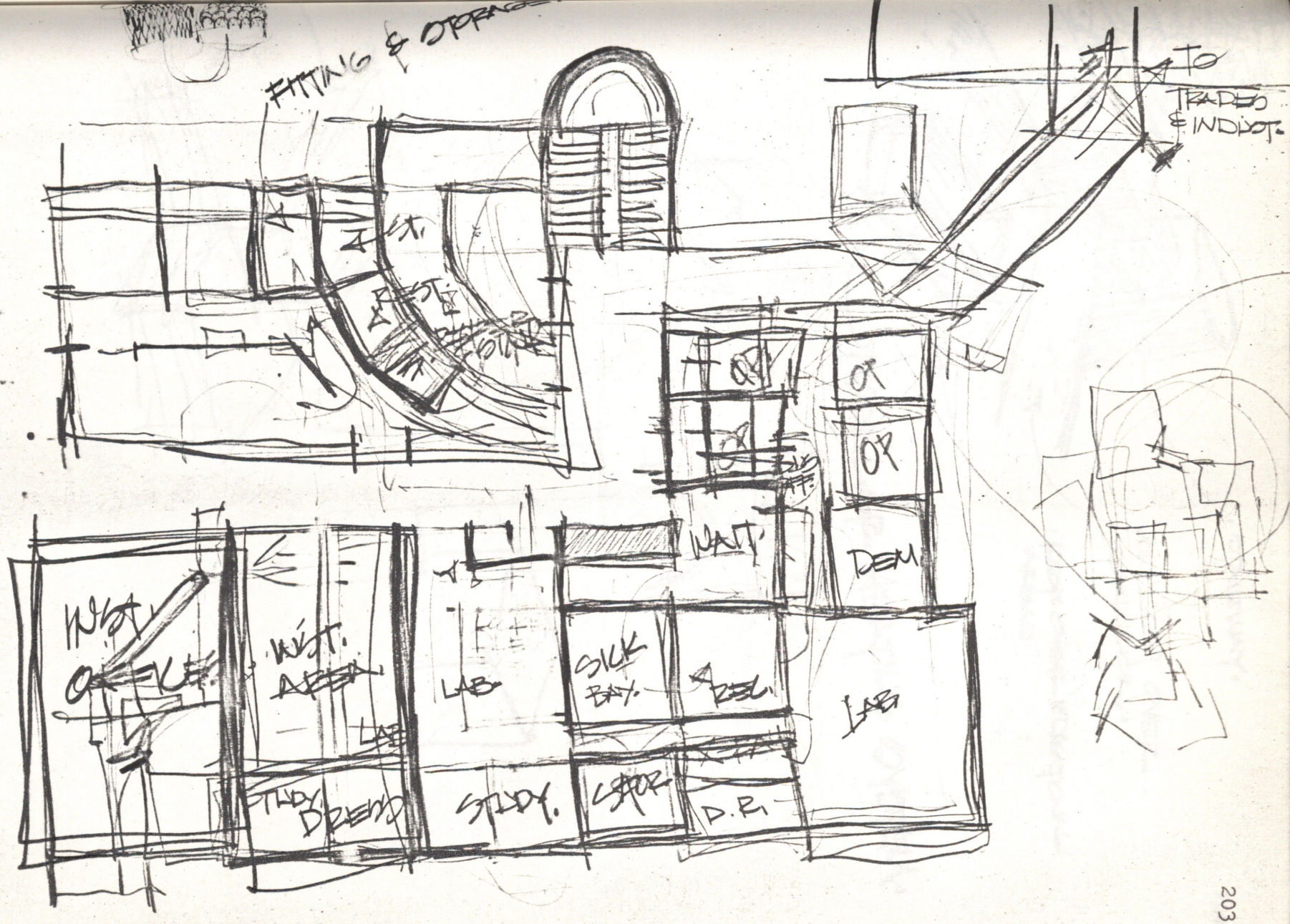
RISE 42'
MAX STEPS 5.

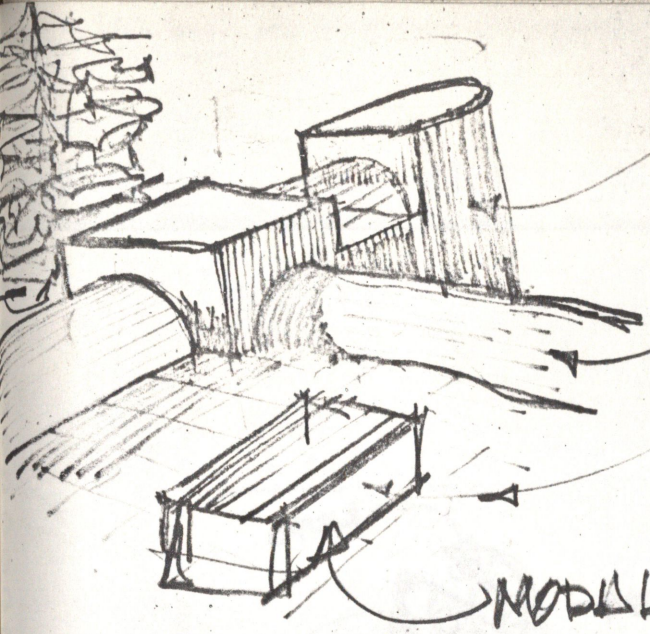


CLEAR HOISTWAY. 6'-7 x 9'-4"
8-4
6-8
7-8"

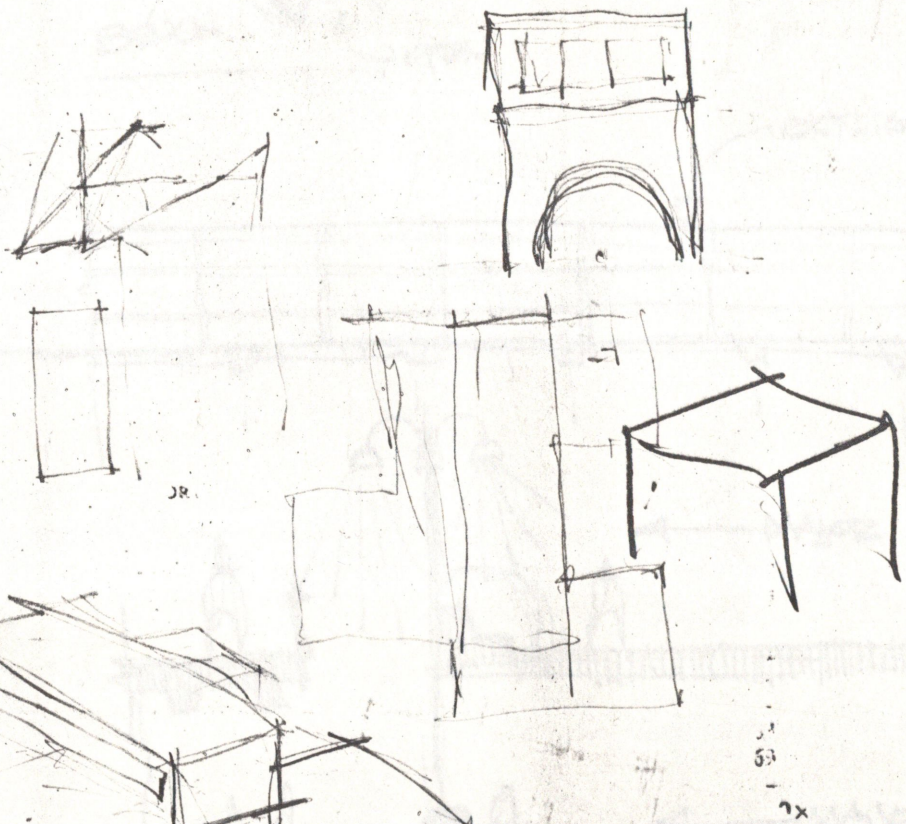


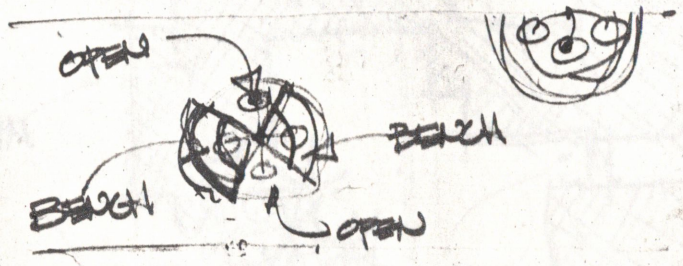
CONVERSATION PIT IN CORRIDOR

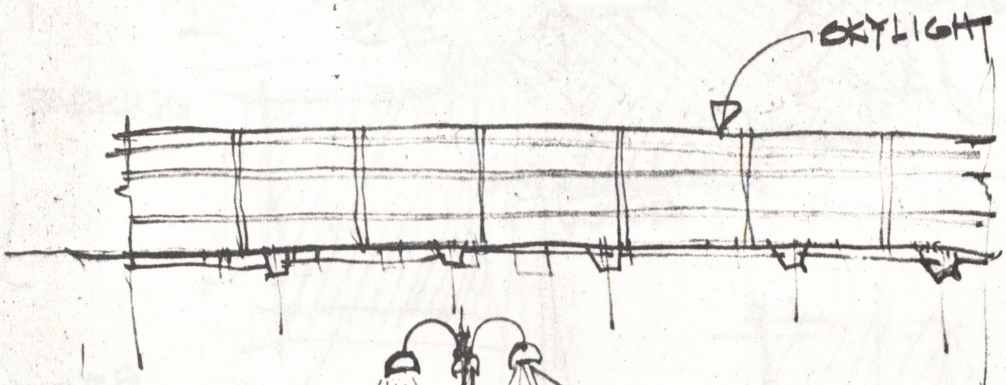

FITTING & STORAGE
TO TRADES & INDUST.
WAIT.
DEM
LAB
SICK BAY.
LAB
STUDY.
D.R.

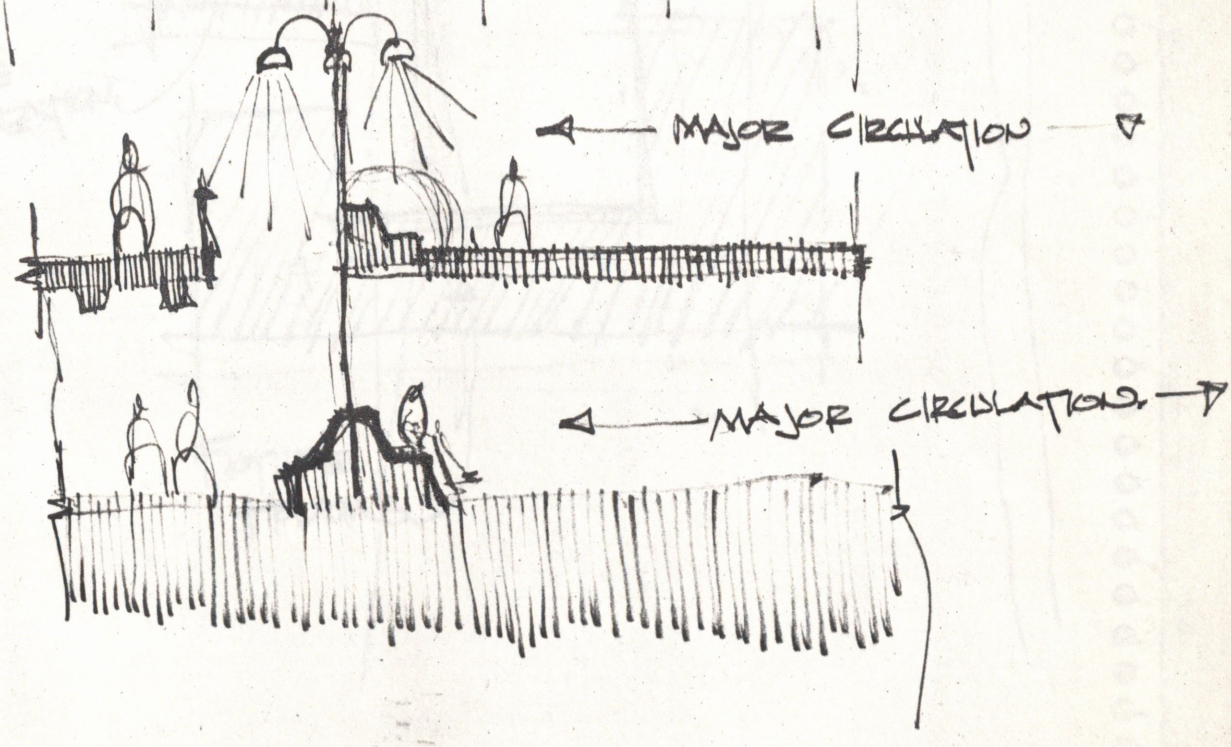


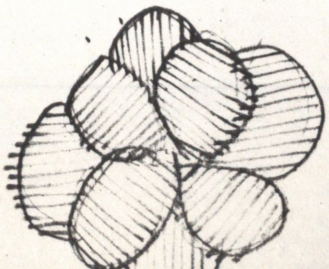
MODULAR HEATING SYSTEM.



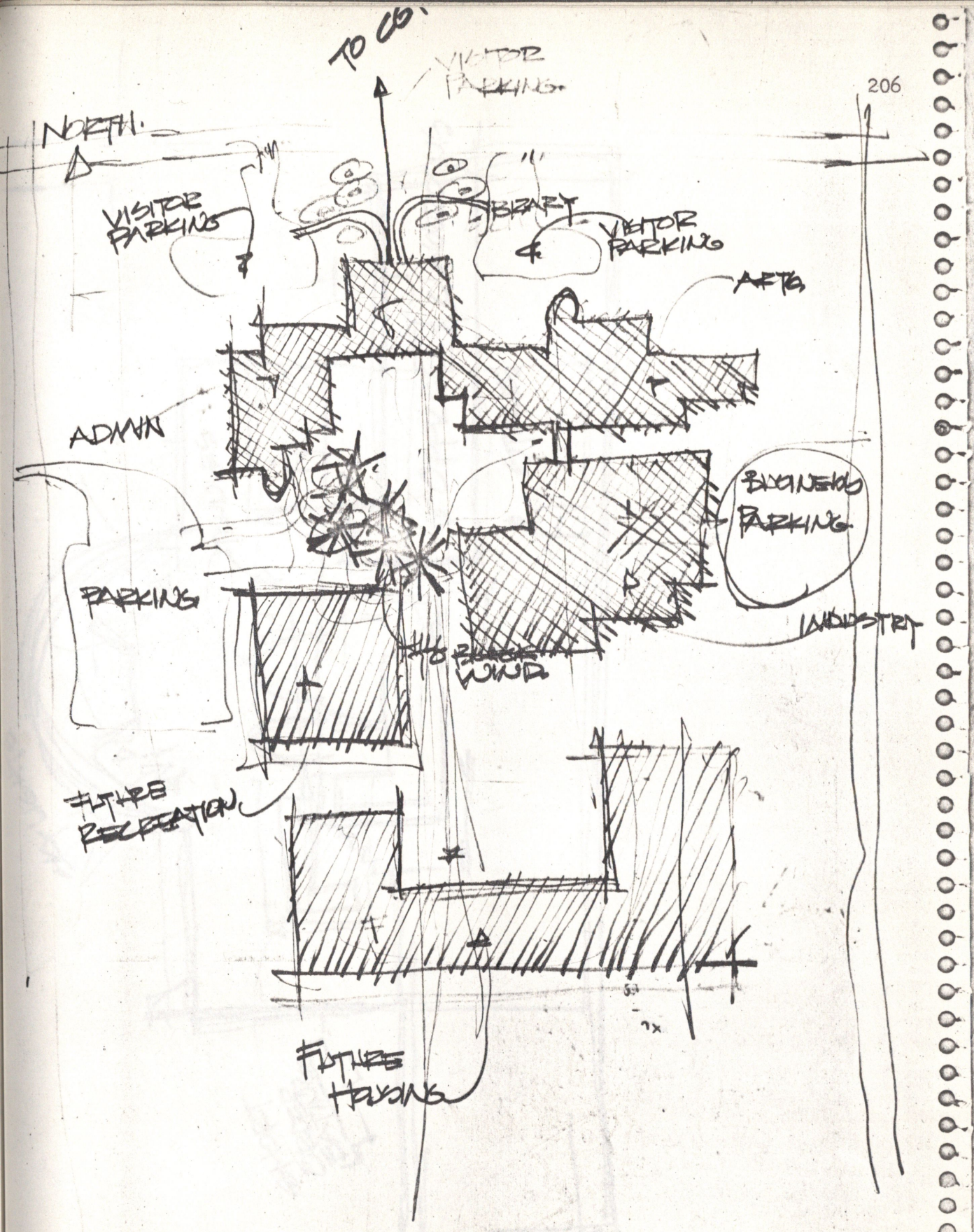


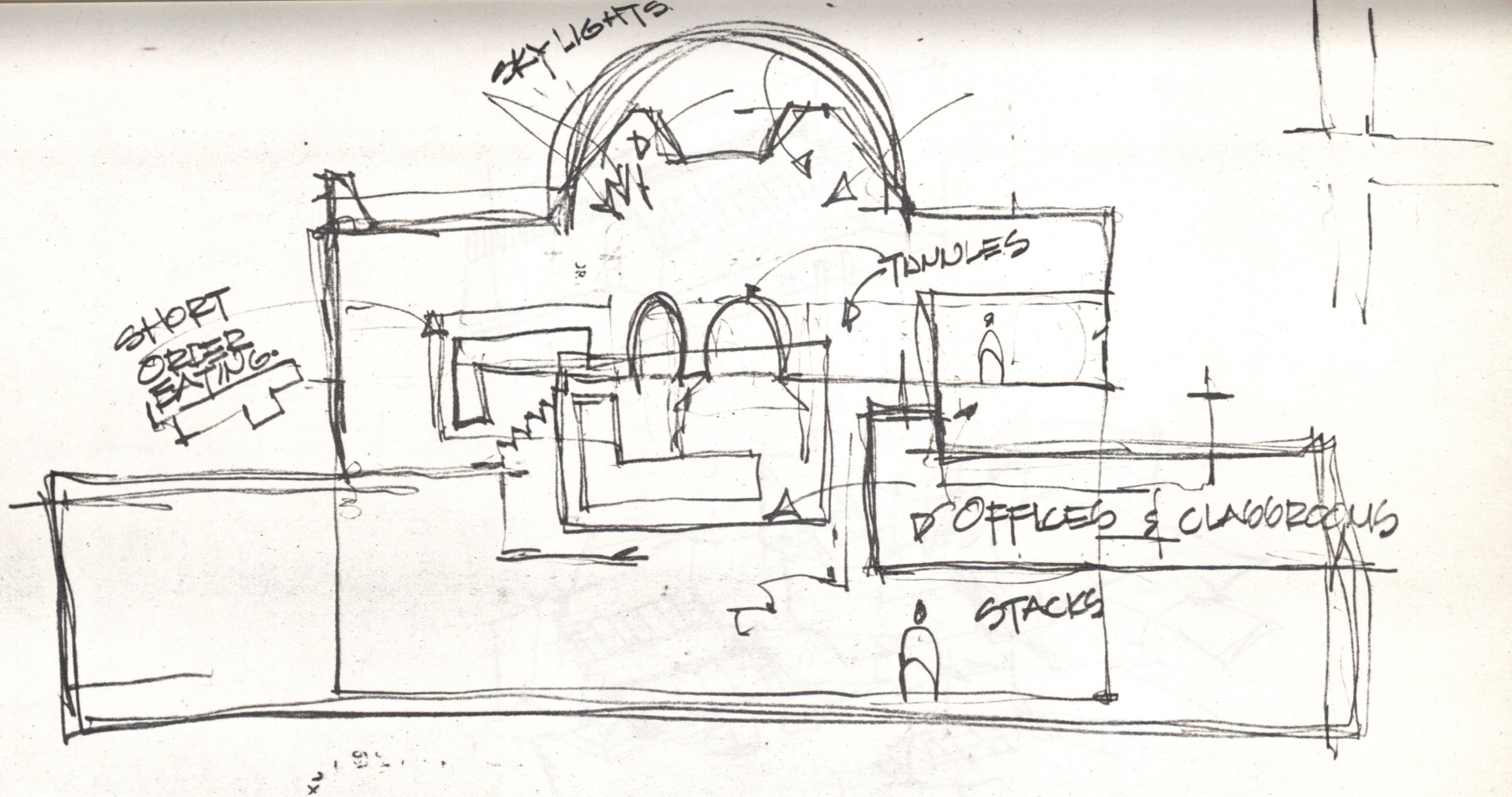


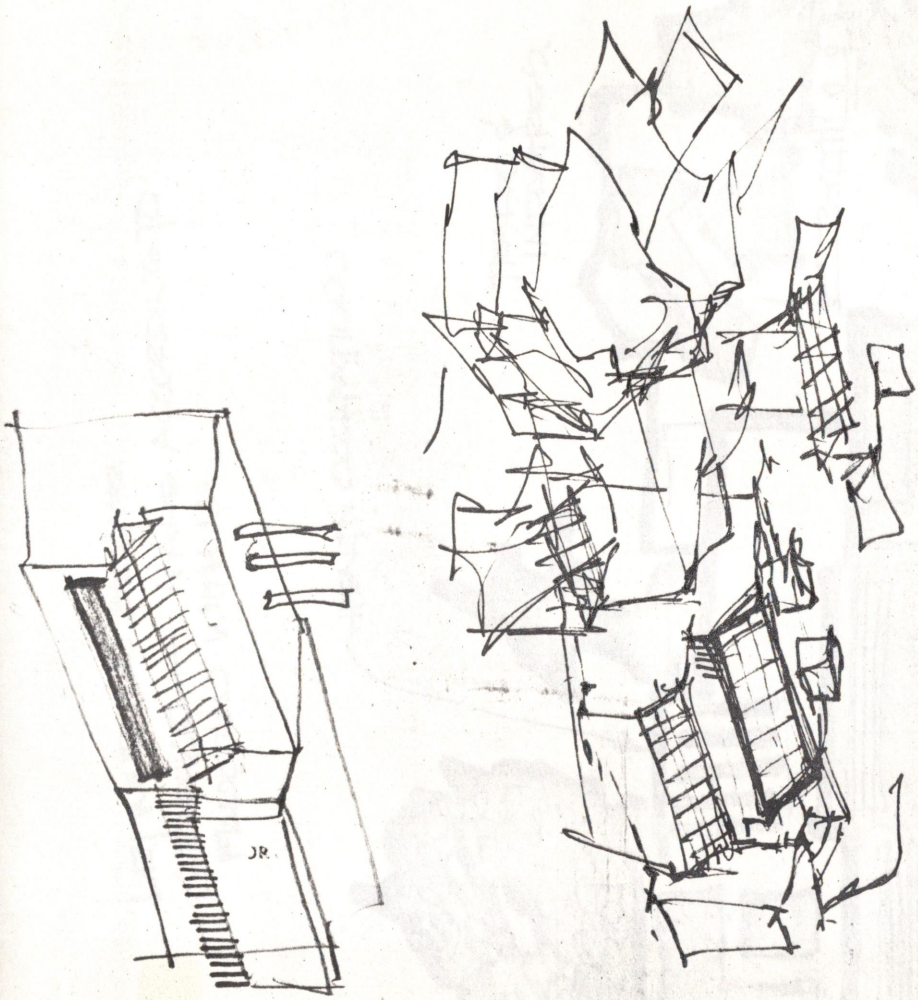




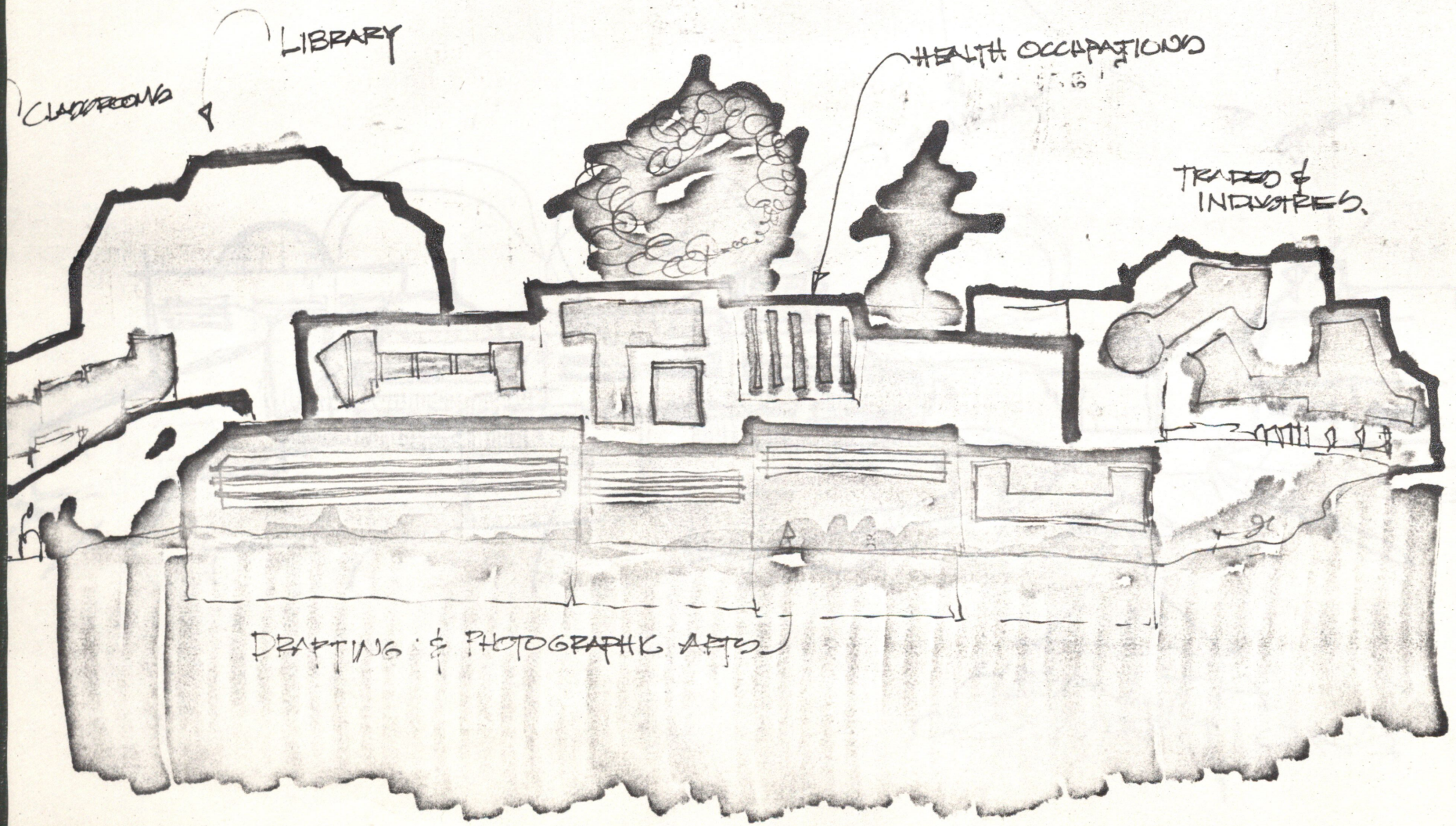
INTERIOR LIGHTING


TO CBD
VISITOR PARKING
NORTH
VISITOR PARKING
LIBRARY
VISITOR PARKING
ARTS
ADMIN
BUSINESS PARKING
PARKING
INDUSTRY
FUTURE RECREATION
FUTURE HOUSING

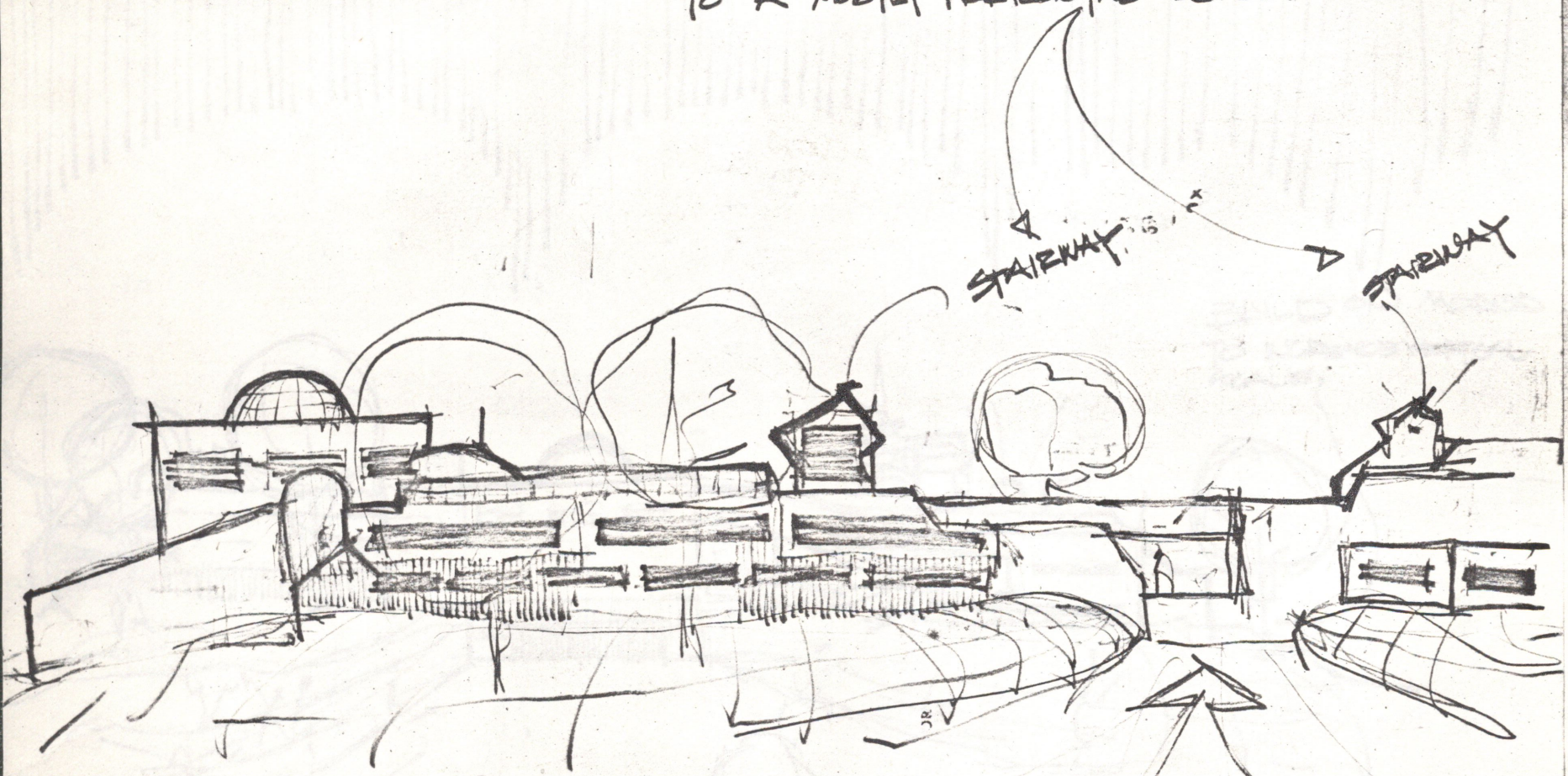

SKYLIGHTS
TUNNELS
SHORT ORDER EATING
OFFICES & CLASSROOMS
STACKS

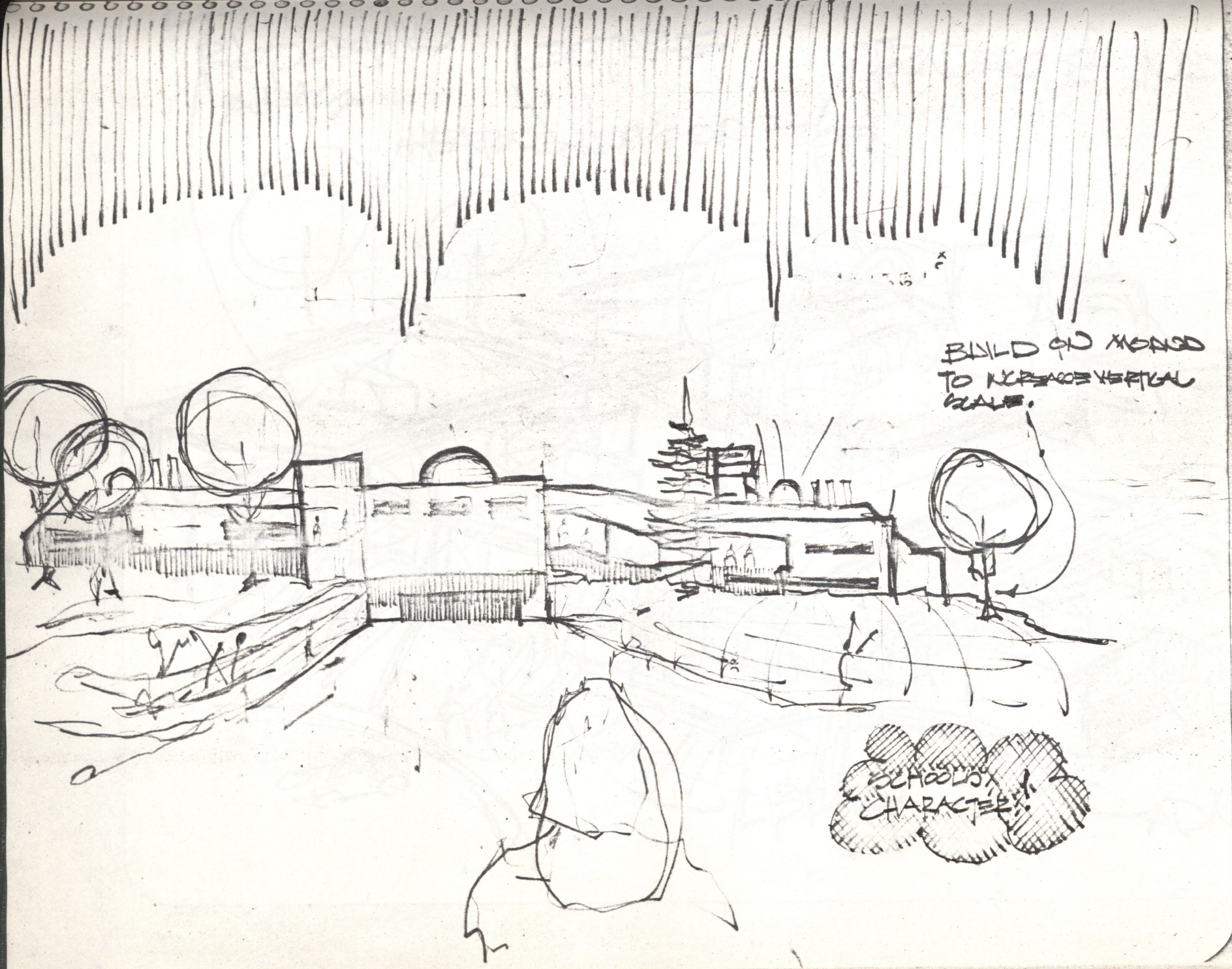


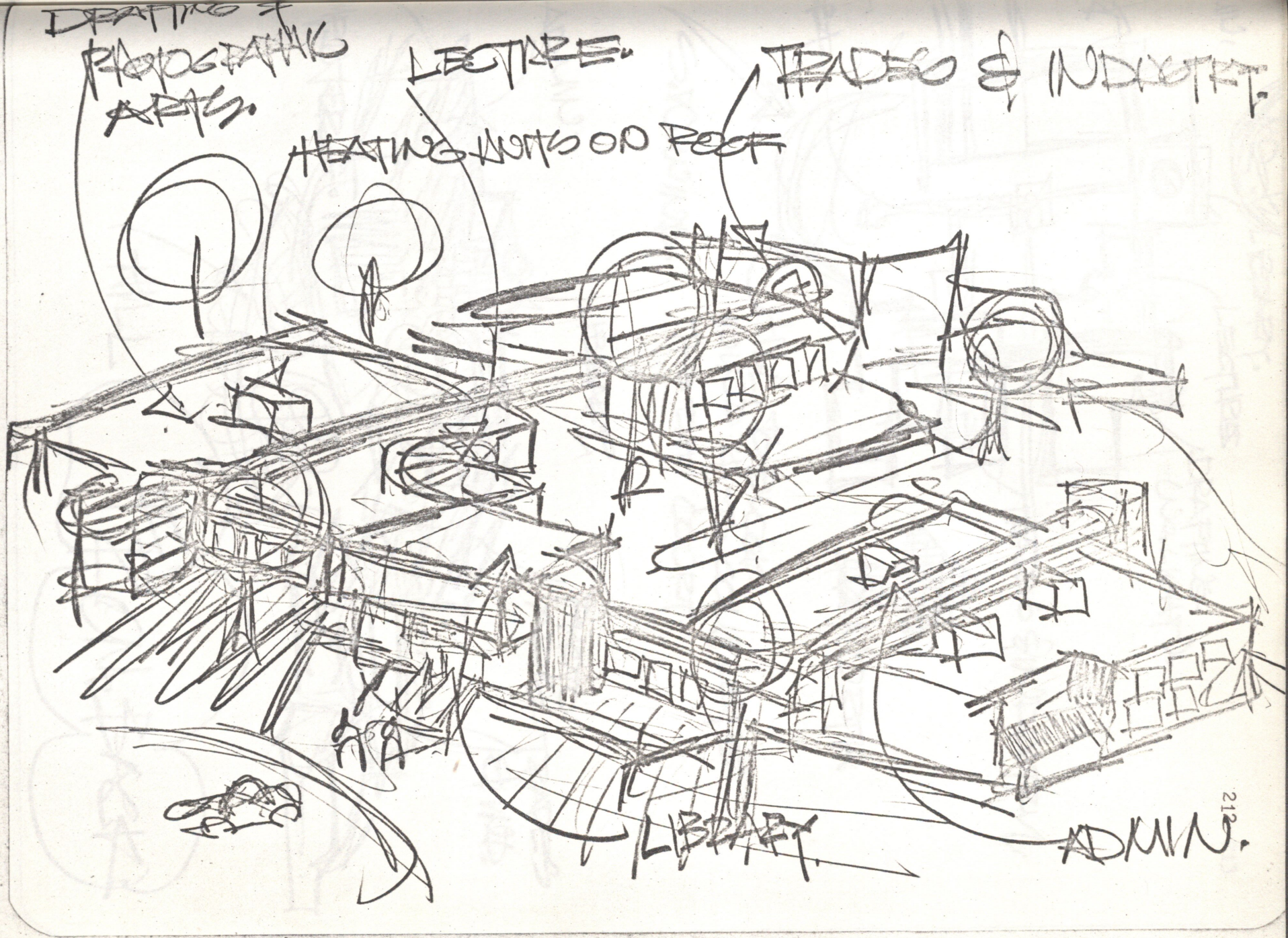
LET WINDOWS BECOME GRAPHICS. —— MAKE ACCORDING TO FUNCTION WITHIN.

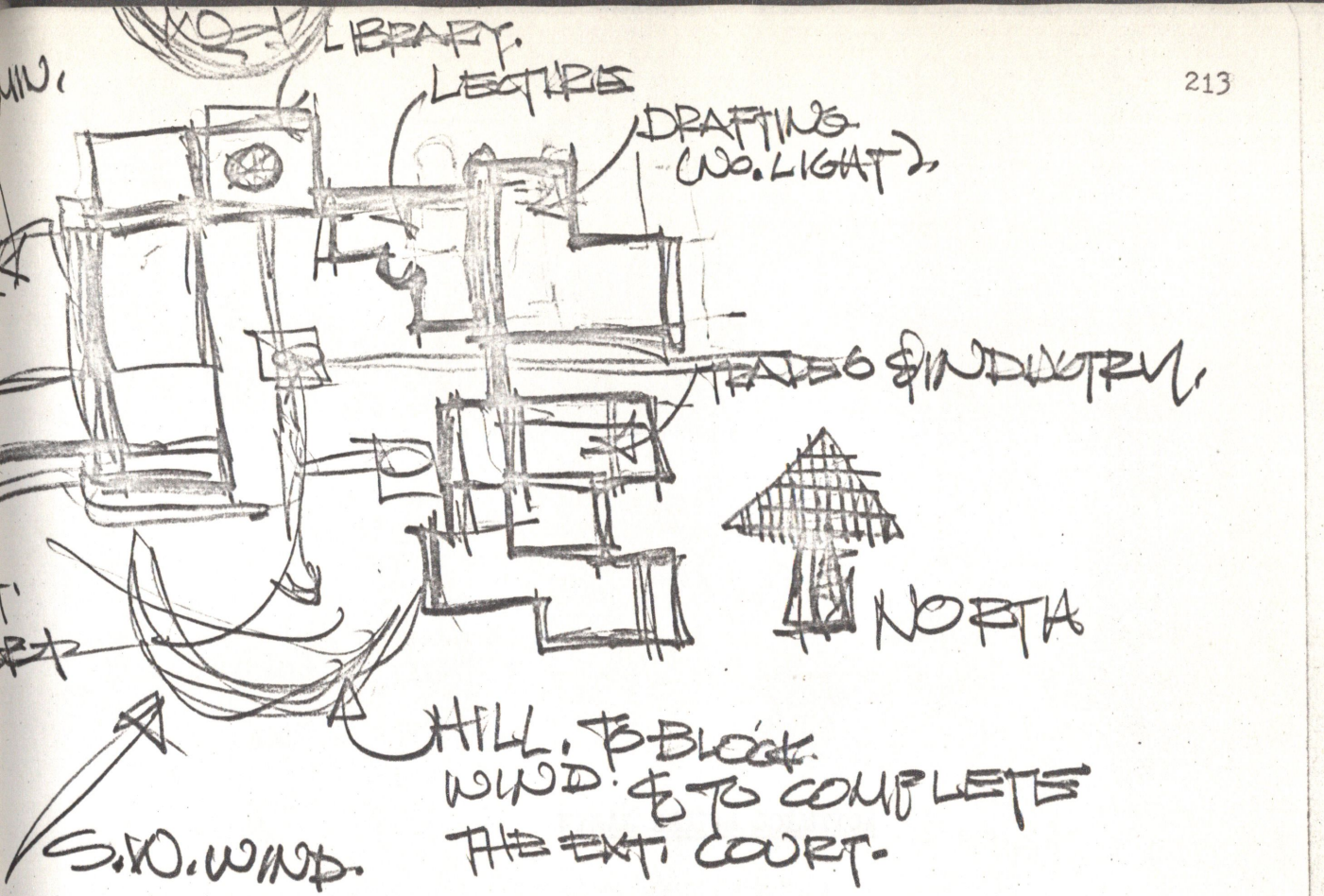


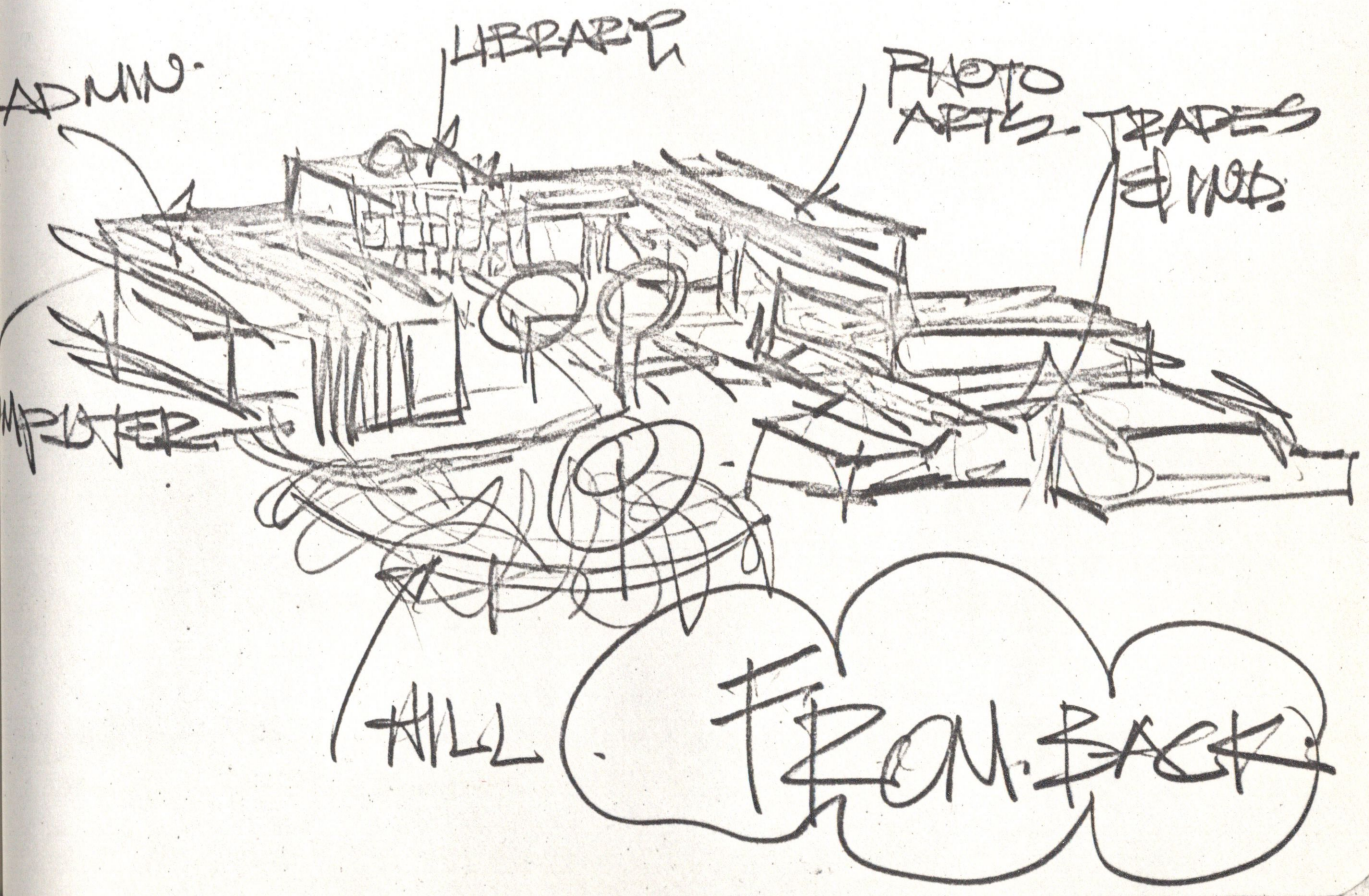
USE VERTICAL CIRCULATION
ELEMENTS TO GIVE SOME VERTICALITY
TO A MOSTLY HORIZONTAL SCHOOL.



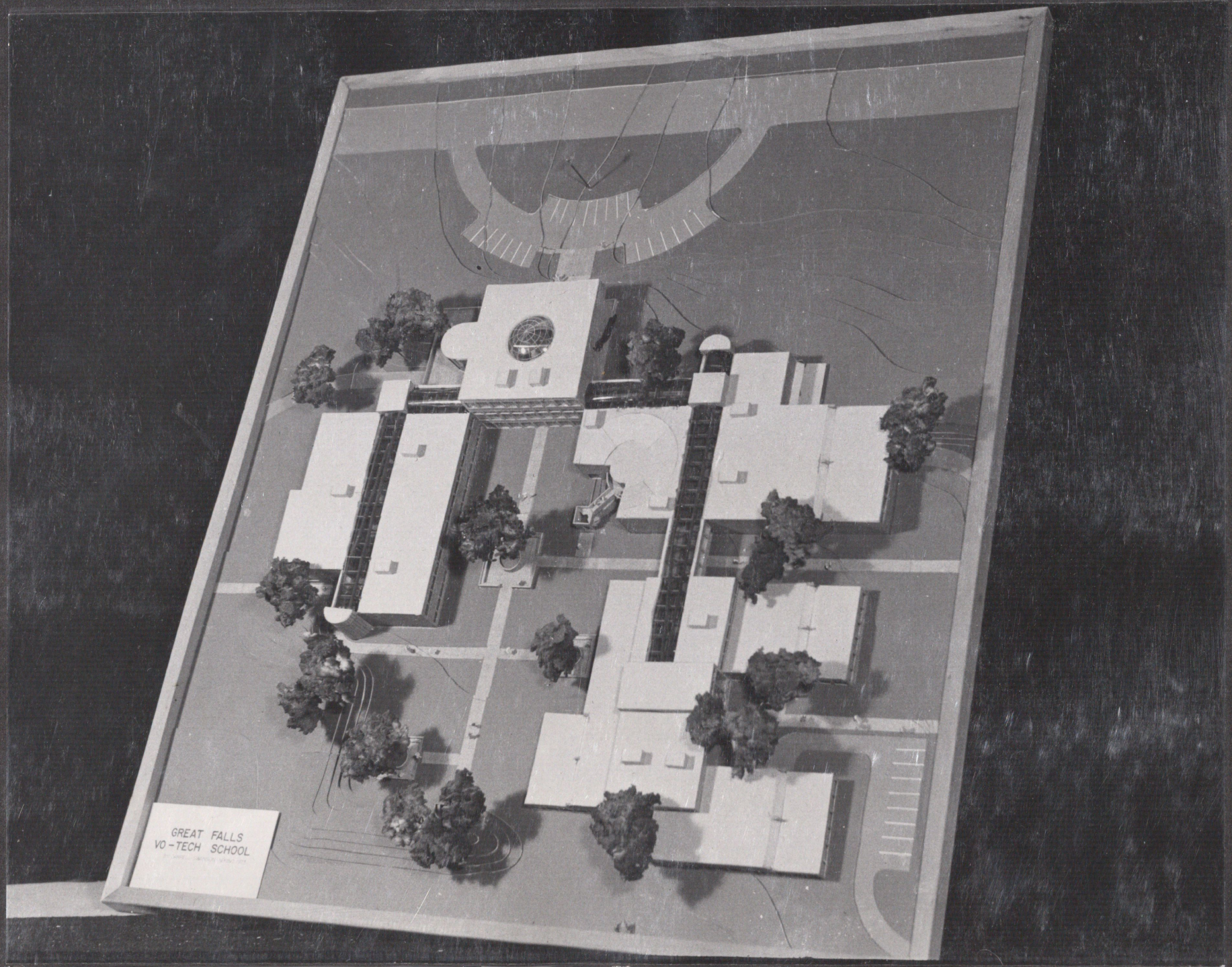

BUILD ON MOUND TO INCREASE VERTICAL SCALE.
SCHOOL'S CHARACTER!


DRAFTING &
PHOTOGRAPHIC
ARTS.
LECTURE.
RADIO & INDUSTRY.
HEATING UNITS ON ROOF
LIBRARY.
ADMIN.

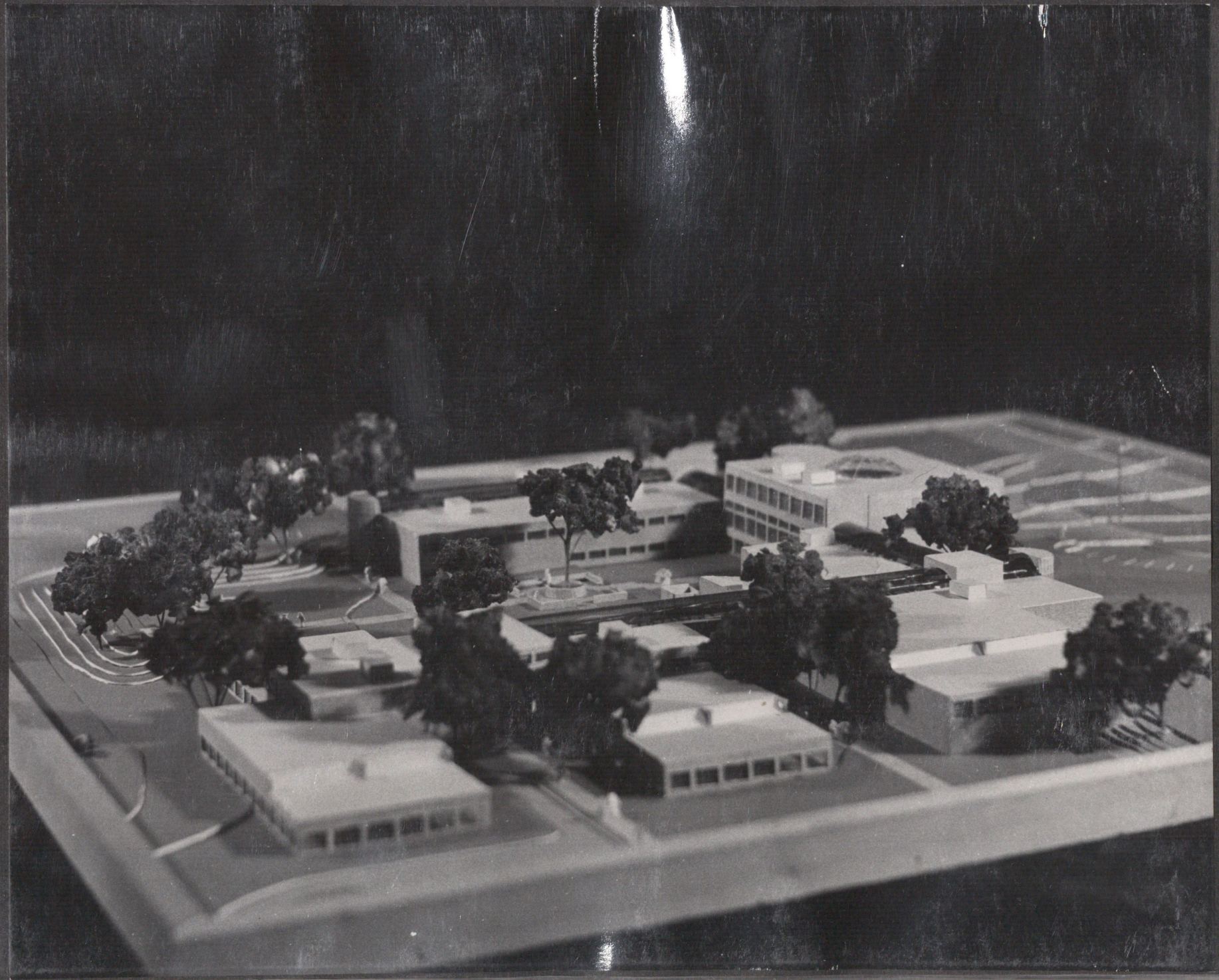

LIBRARY.
LECTURE
DRAFTING
TRADES & INDUSTRY.
NORTH
HILL. TO BLOCK
WIND. & TO COMPLETE
THE EXT. COURT.
S.W. WIND.

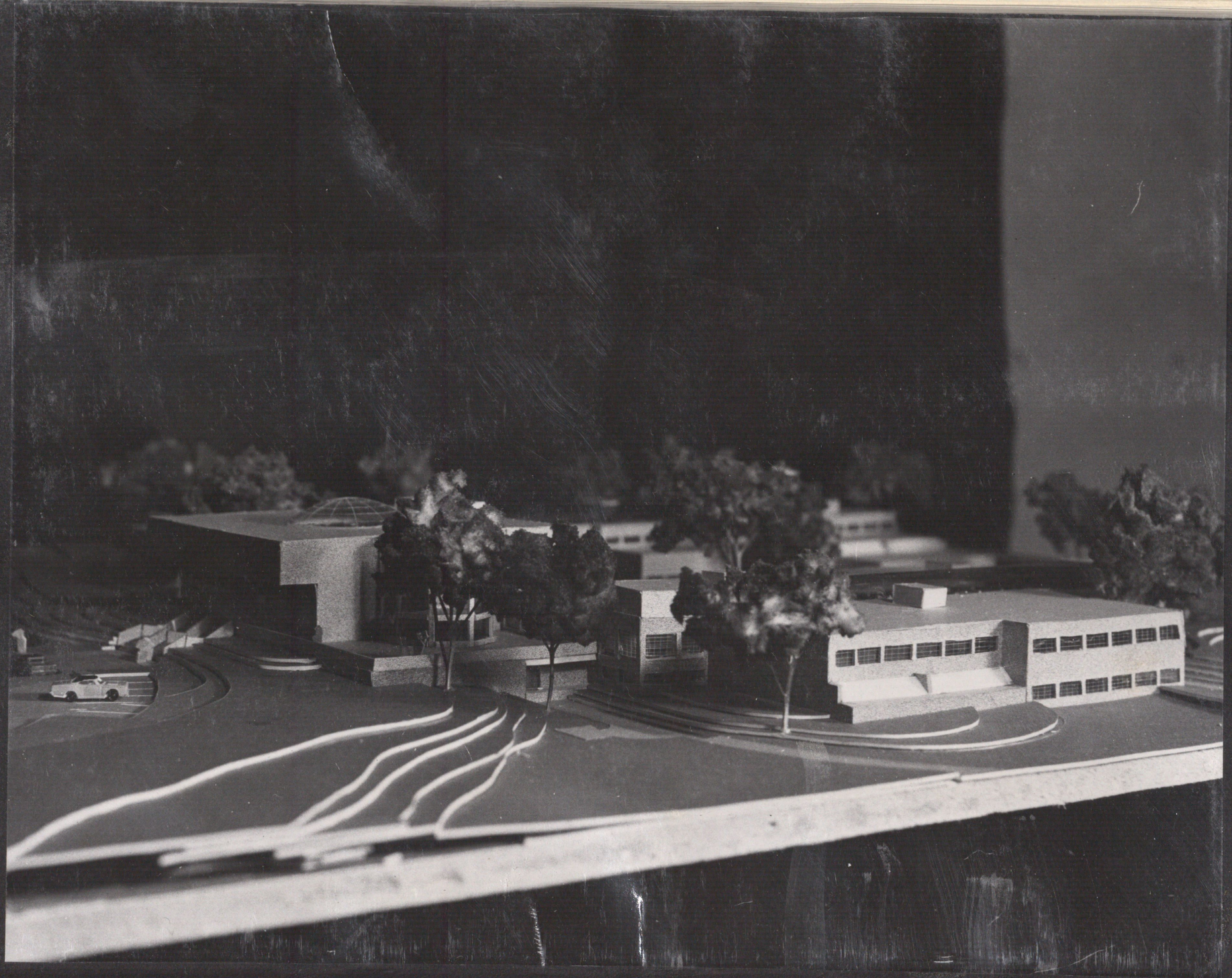

LIBRARY
PHOTO
ARTS.
TRADES
& IND.
HILL FROM BACK.

FINAL DESIGN SOLUTION


GREAT FALLS
VO-TECH SCHOOL

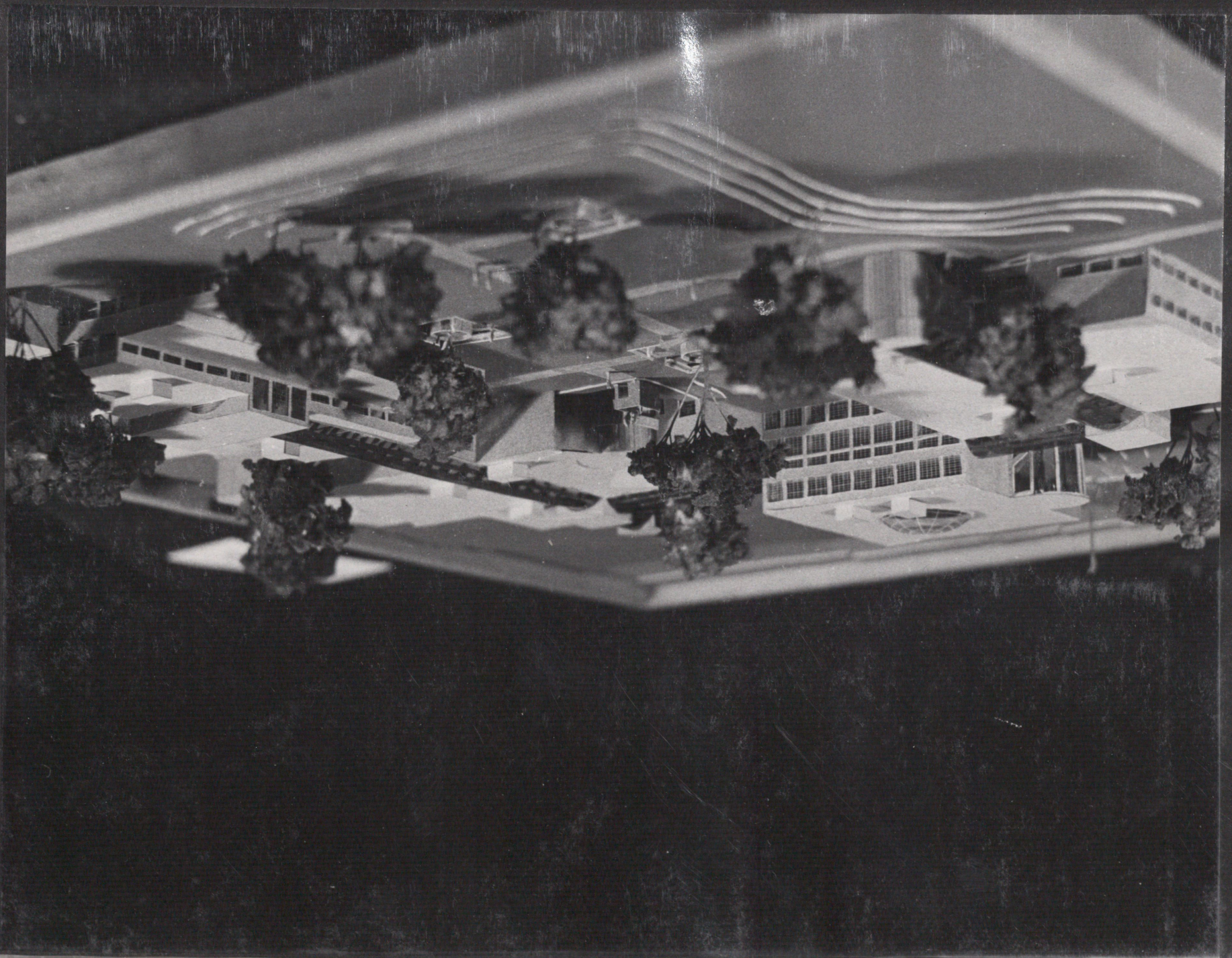

GREAT FALLS
VO-TECH SCHOOL
BY DARRELL SWANSON - SPRING 1973

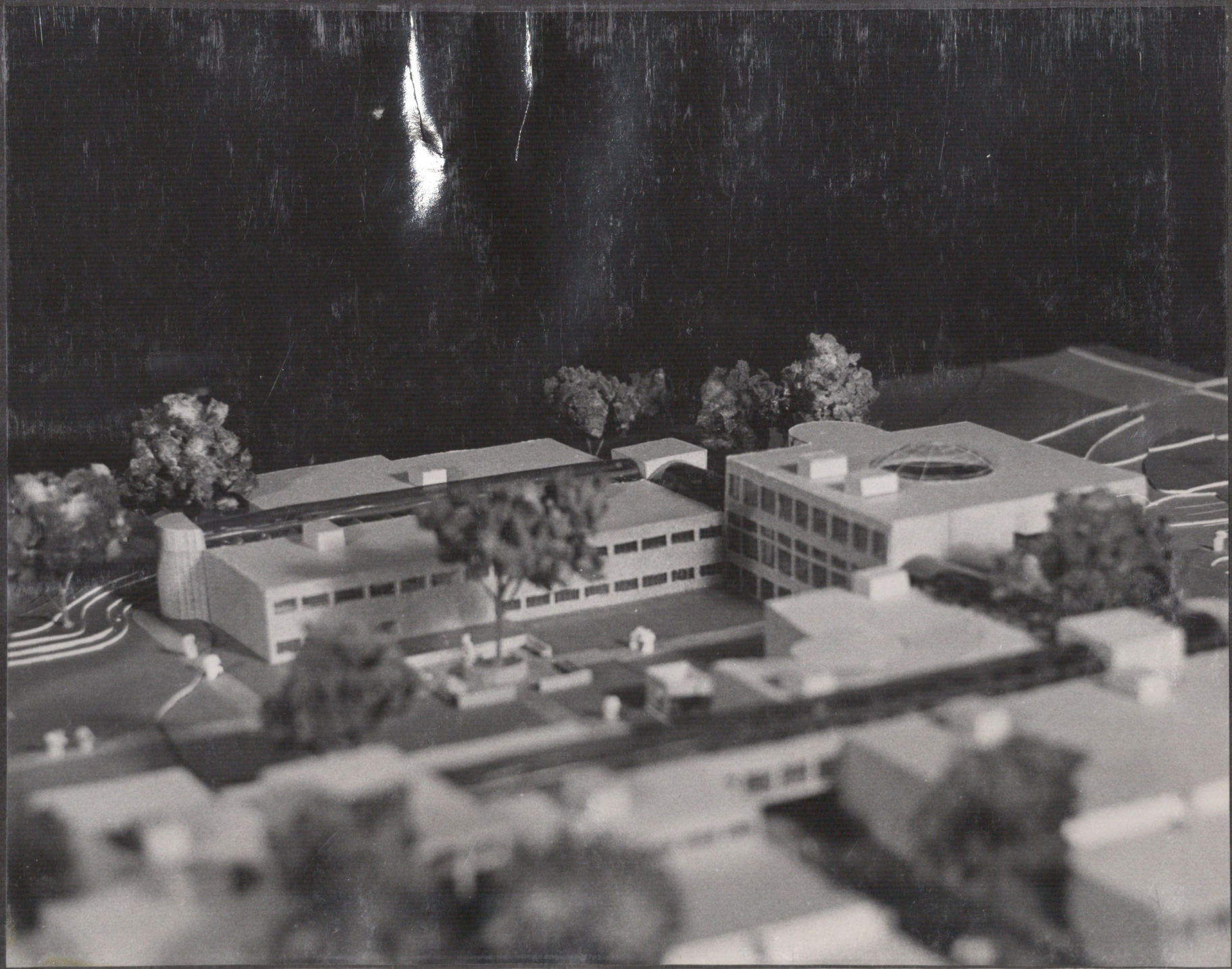


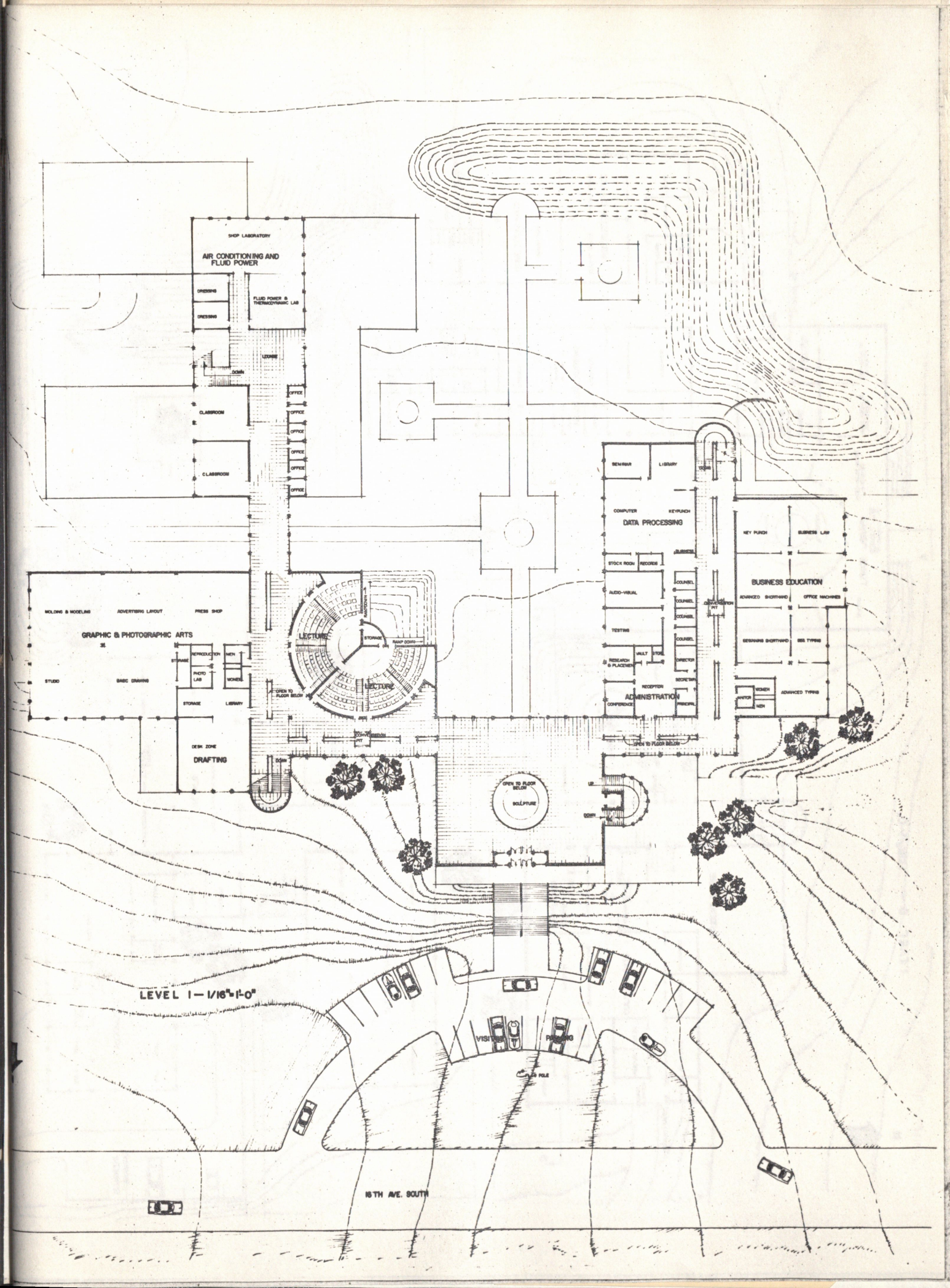


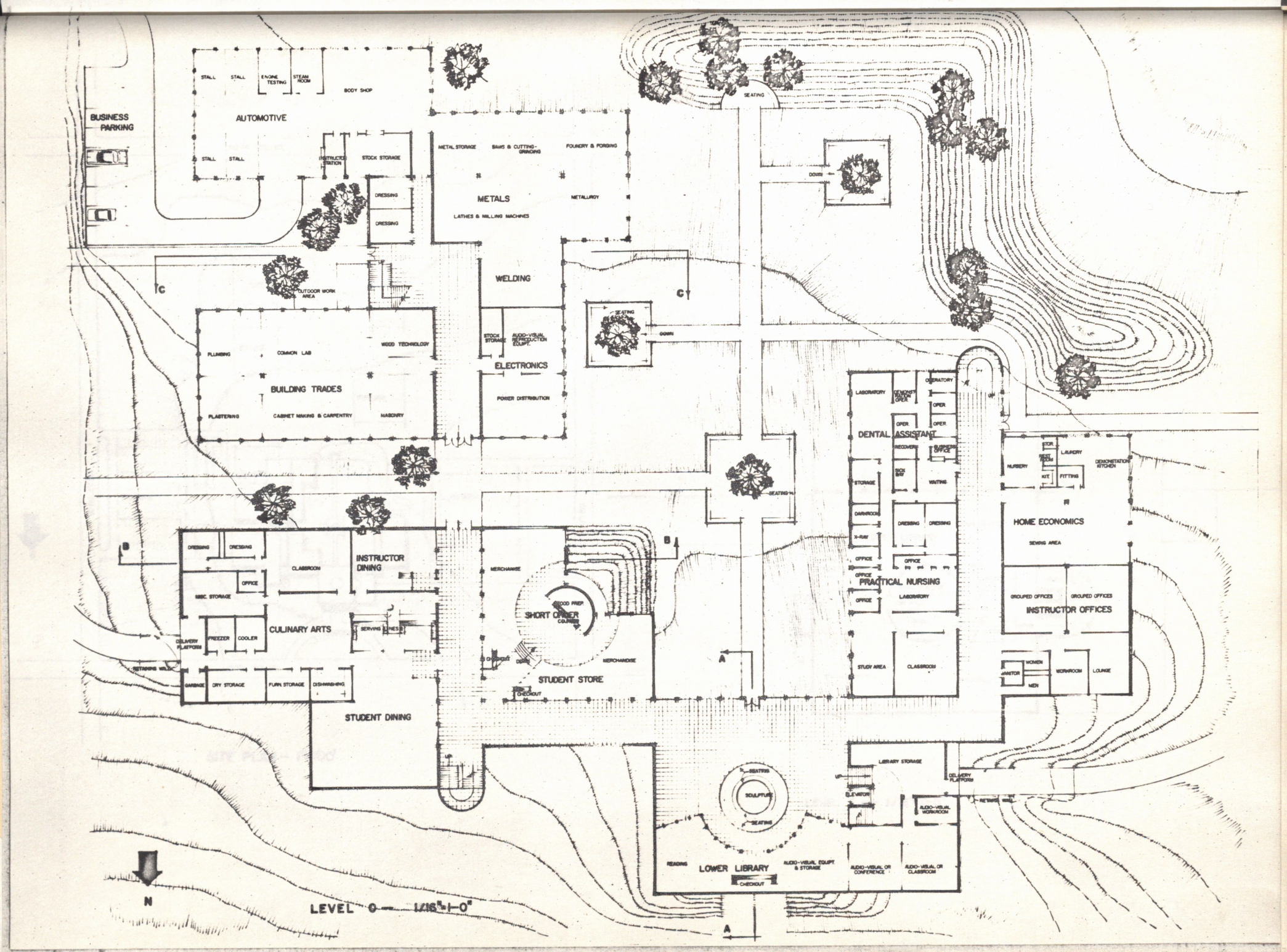


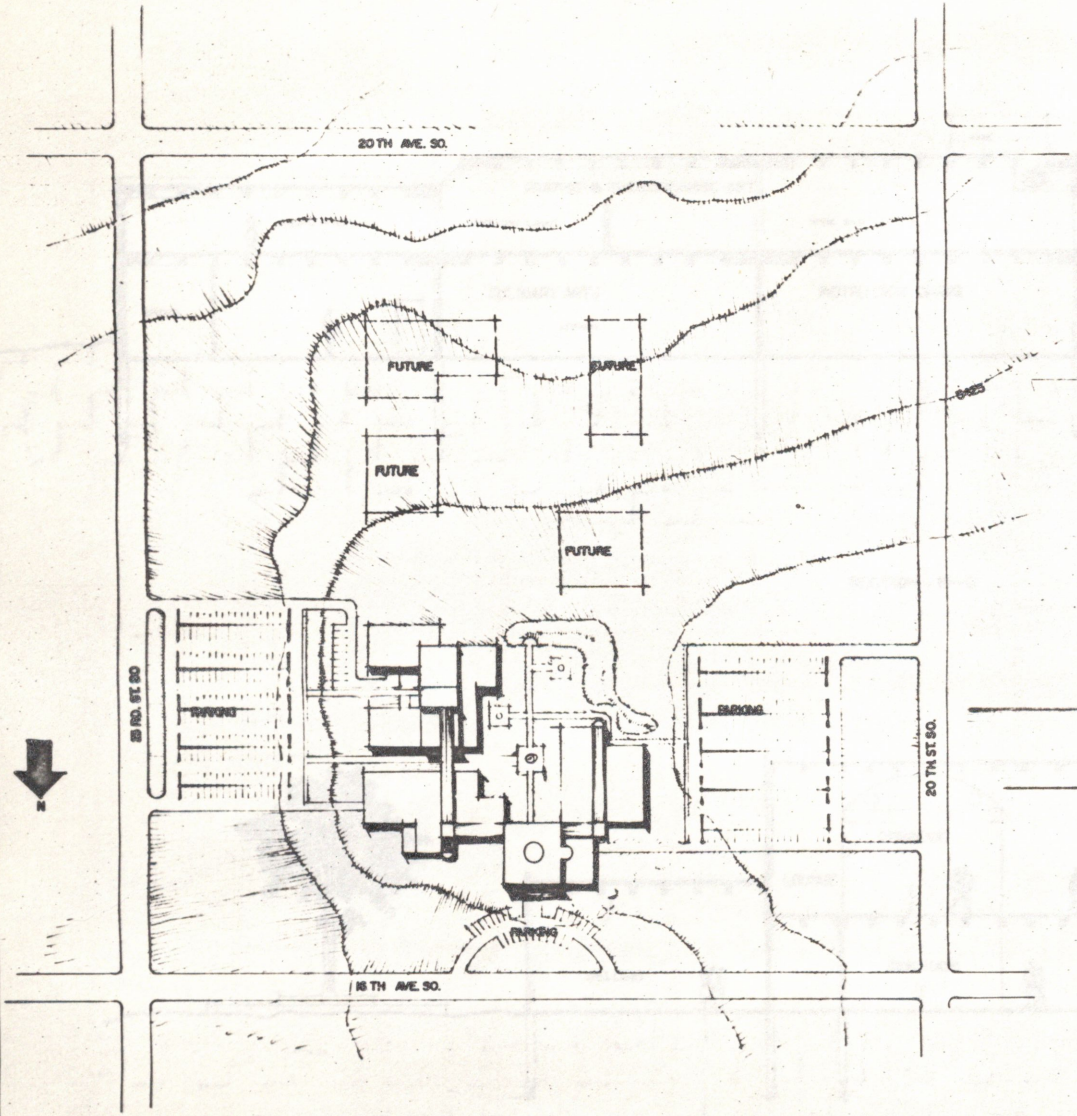




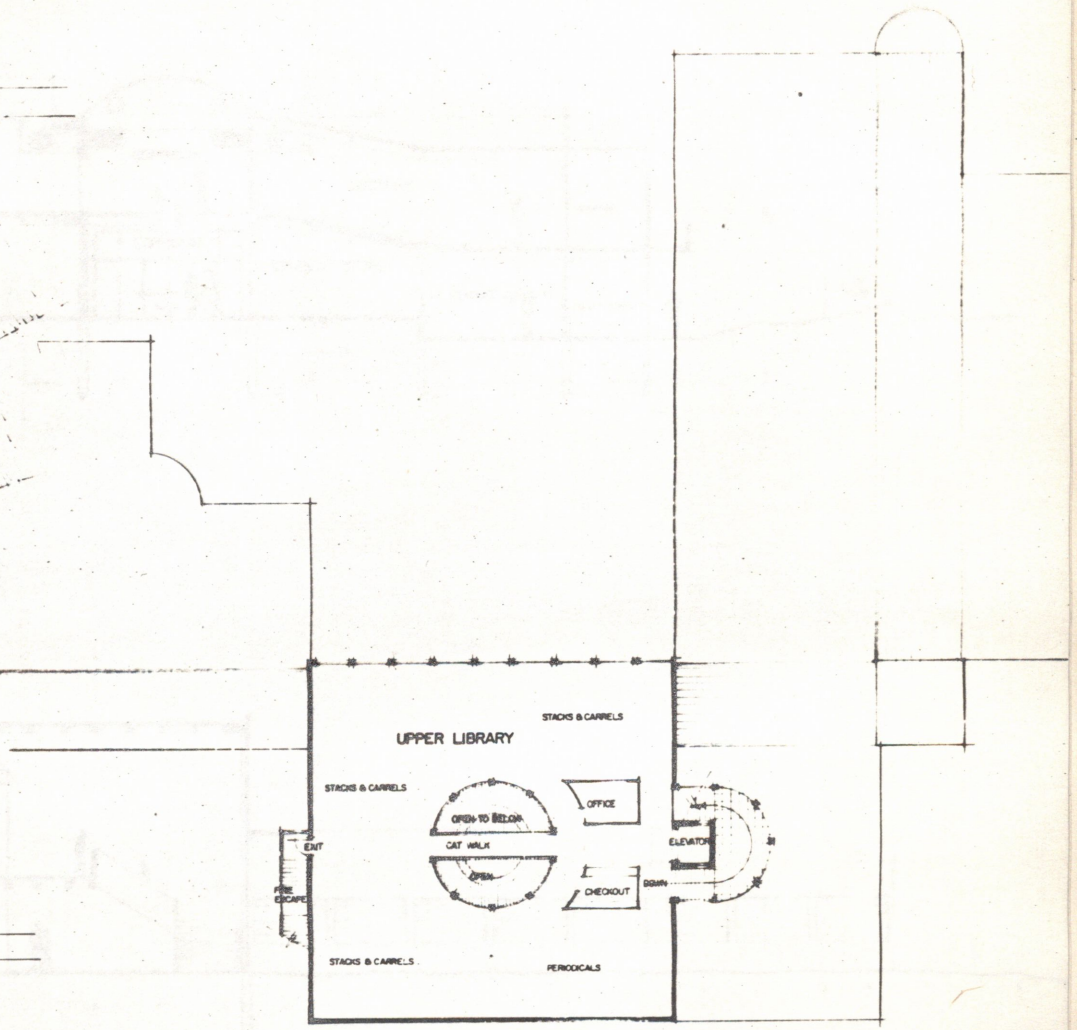



SHOP LABORATORY
AIR CONDITIONING AND FLUID POWER
DRESSING
DRESSING
FLUID POWER & THERMODYNAMIC LAB
LOUNGE
DOWN
CLASSROOM
CLASSROOM
OFFICE
OFFICE
OFFICE
OFFICE
OFFICE
OFFICE
SEMINAR
LIBRARY
COMPUTER
KEYPUNCH
DATA PROCESSING
KEY PUNCH
BUSINESS LAW
STOCK ROOM
RECORDS
AUDIO-VISUAL
BUSINESS EDUCATION
ADVANCED SHORTHAND
OFFICE MACHINES
TESTING
BEGINNING SHORTHAND
BEG. TYPING
RESEARCH & PLACEMENT
VAULT
STOR.
RECEPTION
CONFERENCE
ADMINISTRATION
ADVANCED TYPING
MOLDING & MODELING
ADVERTISING LAYOUT
PRESS SHOP
GRAPHIC & PHOTOGRAPHIC ARTS
REPRODUCTION
PHOTO LAB
STUDIO
BASIC DRAWING
STORAGE
LIBRARY
DESK ZONE
DRAFTING
LECTURE
STORAGE
RAMP CONTR.
LECTURE
OPEN TO FLOOR BELOW
SCULPTURE
LEVEL 1 — 1/16"=1'-0"
16TH AVE. SOUTH

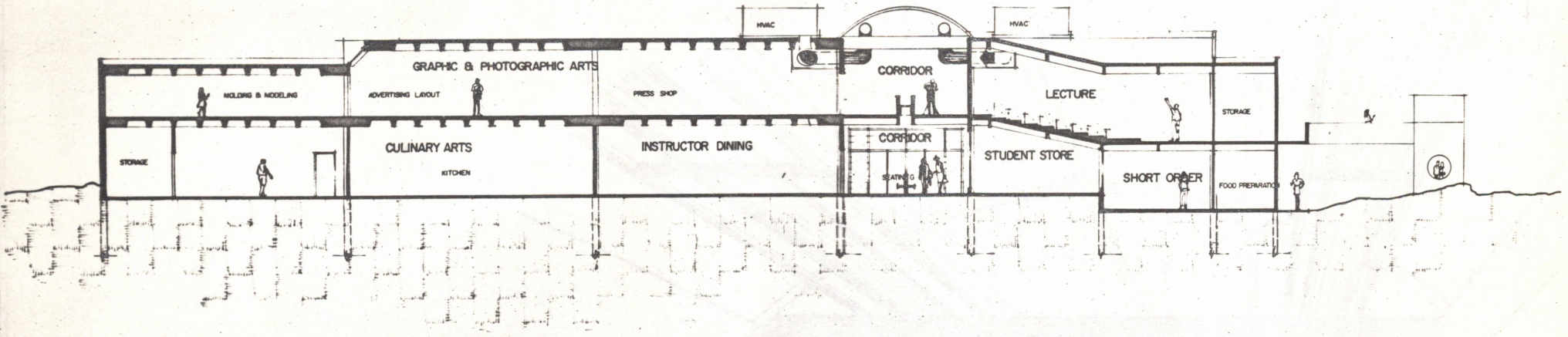

BUSINESS PARKING
AUTOMOTIVE
STALL
STALL
ENGINE TESTING
STEAM ROOM
BODY SHOP
STALL
STALL
INSTRUCTOR STATION
STOCK STORAGE
DRESSING
DRESSING
METALS
METAL STORAGE
SAWS & CUTTING-GRINDING
FOUNDRY & FORGING
METALLURGY
LATHES & MILLING MACHINES
WELDING
OUTDOOR WORK AREA
C
C
BUILDING TRADES
PLUMBING
COMMON LAB
WOOD TECHNOLOGY
PLASTERING
CABINET MAKING & CARPENTRY
MASONRY
STOCK STORAGE
AUDIO-VISUAL REPRODUCTION EQUIPT.
ELECTRONICS
POWER DISTRIBUTION
SEATING
DOWN
SEATING
DOWN
SEATING
B
B
DRESSING
DRESSING
OFFICE
CLASSROOM
INSTRUCTOR DINING
MISC. STORAGE
CULINARY ARTS
DELIVERY PLATFORM
FREEZER
COOLER
SERVING LINES
RETAINING WALL
GARBAGE
DRY STORAGE
FURN. STORAGE
DISHWASHING
STUDENT DINING
MERCHANDISE
SHORT ORDER COUNTER
FOOD PREP.
CHECKOUT
MERCHANDISE
STUDENT STORE
CHECKOUT
A
A
SEATING
SCULPTURE
SEATING
READING
LOWER LIBRARY
CHECKOUT
AUDIO-VISUAL EQUIPT. & STORAGE
AUDIO-VISUAL OR CONFERENCE
AUDIO-VISUAL OR CLASSROOM
LIBRARY STORAGE
ELEVATOR
DELIVERY PLATFORM
AUDIO-VISUAL WORKROOM
LABORATORY
DENTIST CHAIR
OPERATORY
OPER.
OPER.
OPER.
RECOVER
SURGERY OFFICE
TECH. ROOM
STORAGE
WAITING
DARKROOM
X-RAY
DRESSING
DRESSING
OFFICE
OFFICE
OFFICE
OFFICE
DENTAL ASSISTANT
PRACTICAL NURSING
LABORATORY
STUDY AREA
CLASSROOM
NURSERY
LAUNDRY
KIT.
FITTING
DEMONSTRATION KITCHEN
HOME ECONOMICS
SEWING AREA
GROUPED OFFICES
GROUPED OFFICES
INSTRUCTOR OFFICES
JANITOR
WOMEN
MEN
WORKROOM
LOUNGE
N
LEVEL 0 — 1/16"=1'-0"



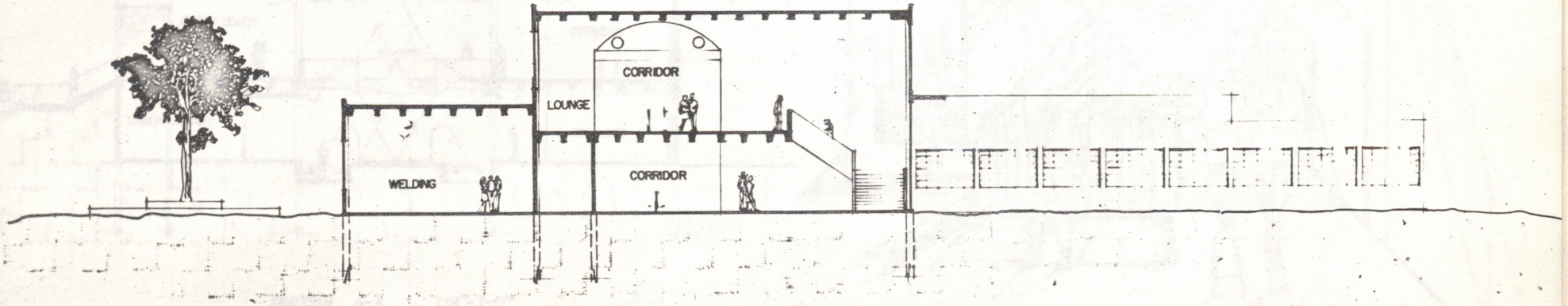
SITE PLAN – 1"= 100'



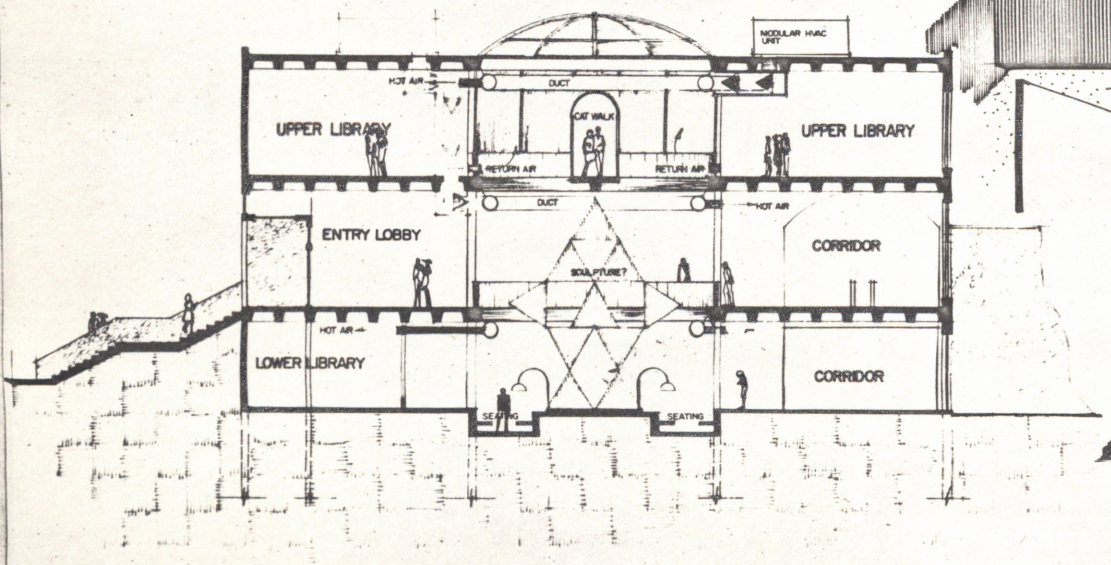
LEVEL 2 — 1/16"= 1'-0"



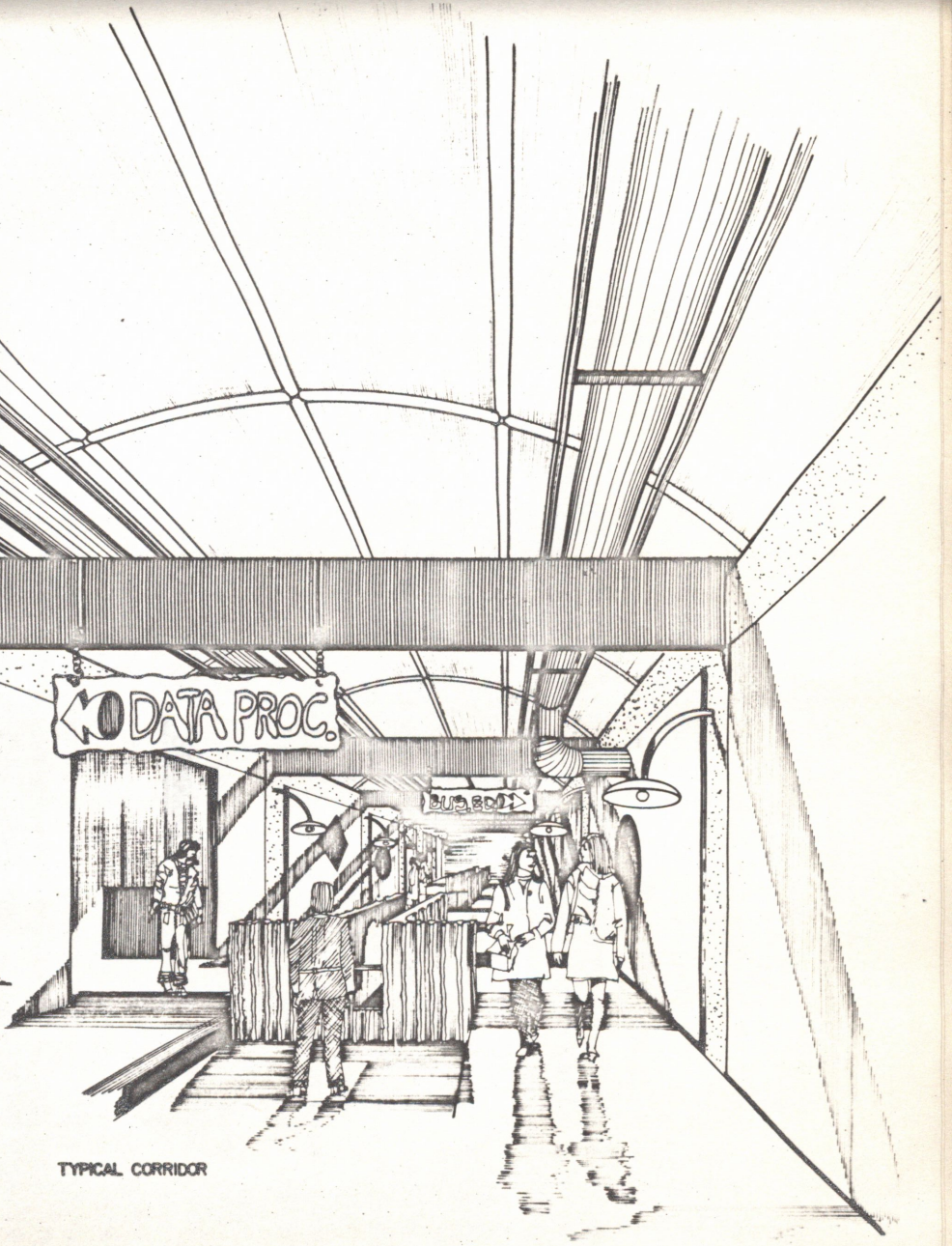
SECTION B-B



SECTION C-C



SECTION A–A 1/8"=1'-0"



TYPICAL CORRIDOR

SUMMARY

CONCLUDING COMMENTS

Because this is a facility that will be used very extensively at night as well as during the day, it is very important to create a visual excitement of the building at night as well as during the day. The repeated forms of the windows will be an ever changing pattern of light at night as the different areas of the school are used. The barrell vault is a consistant visual accent to the circulation pattern for which the facility was designed. The stairways can also be expressed as they are an irregular size and shape from that of the regular modulated ones of the classrooms. The slanted, industrial type of frosted glass further orients the visitor where changes in ceiling height occur and therefore maybe further excitement occurs.

I relied on architectural rules such as functional form and structure as my primary design considerations. I felt these and, my concept of having the school be reminiscent of industrial buildings in a subtle way and semi-strict institutionalized character would aid and eventually decide what my final solution would entail.

Many times during this thesis I have asked myself this question. Why is this thesis different from other projects? It is that transition from what is considered school work and "real" architecture. Sometime in an architects life this transition has to be made. I know that some graduates of the school of architecture never have this transition and some have it much earlier than the thesis project. I choose to try to make that transition during my thesis because it seemed to be the most logical place to put it. My next project hopefully, will be for a real client and any insight I can have as to what real architecture is, it will be of great help. I also felt that the transition should take place during the thesis because I wanted to be relatively free of considerations such as cost, ease of building, etc. so I could be free with my design and continue my learning process to the ultimate while in school and pick up the other things as they are introduced when it directly affects me.

If some of the things that I have said in my conclusion are a little exxagerated in my design solution, they might be sub-consciously planned that way. However, at this point, I don't think it is anything to worry about because there has to be some starting point in anything that you do. I really believe that this transition is being accomplished smoothly and with success at least moderately and only time and experience will tell from here.

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